

INDIAN FOOD INDUSTRY



VOLUME 17
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JULY/AUGUST

Improvement of
Raisin Quality



Soybean Lecithin



Grading of Jaggery



STATUS OF
RICE BRAN OIL

ASSOCIATION OF FOOD SCIENTISTS AND TECHNOLOGISTS (INDIA), MYSORE - 570 013

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- Promotion of research, development and training in the Science, Technology and Engineering of Food.
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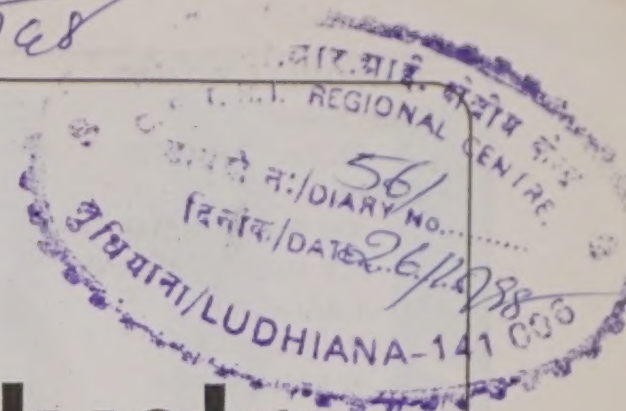
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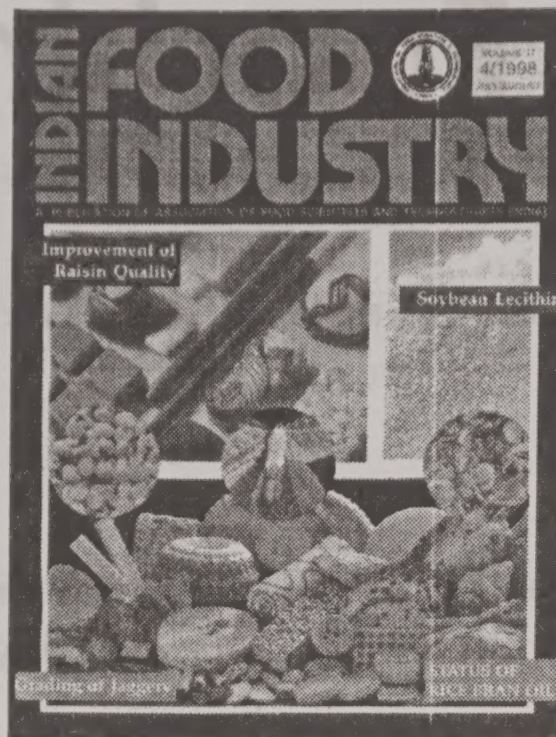
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Soy, the source of lecithin and products containing lecithin

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Review articles, technology papers based on R&D work and reports on various aspects concerning food industry are welcome from food scientists and technologists from industry, research institutions and other related organisations. Contributors are advised to provide good quality illustrations in the form of charts and photographs along with the manuscripts. The Editorial Board reserves the right to edit the manuscripts in order to make them suitable for publication in the journal, while assuming no responsibility for the statements and opinions expressed by the contributors, nor will they bind AFST (1) in any way. Readers are free to air their views through letters which may be published in the journal from time to time.

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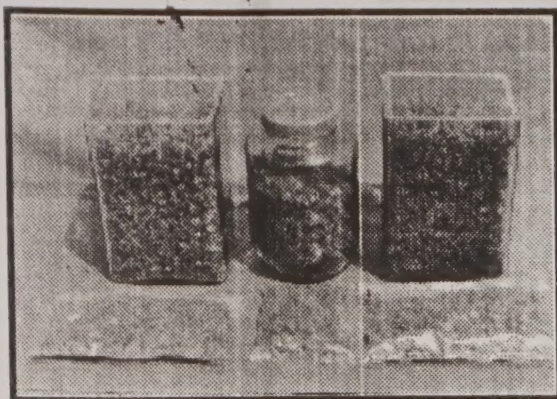
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FROM THE CHIEF EDITOR'S DESK

It would be prudent for an entrepreneur to weigh the costs, paradoxically, of bringing out a quality finished product and of making that product affordable to the consumer. Herein lies his ingenuity to do the balancing act of compromising the two diametrically opposite approaches. Imparting quality to a product is cost-intensive. The consumer appreciates quality but not the consequent price of the product. The answer to the dilemma is adoption of the principles of sound science and technology to the manufacturing process. Take the instance of the contamination of microbial toxins in food, of which the aflatoxin elaborated by some of the food-infecting moulds is the most notorious. Aflatoxin, a highly reactive molecule is known to target DNA and hence is possibly an important cause of human cancers. Other target molecules in the living cell and consequences are yet to be known. Despite extensive studies, not everything is known about aflatoxin, which has left us with considerable uncertainty about its tolerance limits in foodstuffs and feeds. Some of us slip into dogma, believing the aflatoxin molecule to be worse than the HIV, while some others remain in blissful complacency with total neglect to safeguard against health hazard due to aflatoxin. In our surmise it is due to this lack of indepth knowledge, that the aflatoxin question has become a strait jacket posing a serious threat to enterprise in Food Processing Industry. It is learnt that the European Commission has proposed a total permissible level of aflatoxin in groundnuts, cashewnuts, walnuts, pepper and oil cakes shall not exceed ten parts per billion (10 ppb) of which the type B₁ aflatoxin cannot be more than 5 ppb where the product is not for direct human consumption. Where it is meant for direct human consumption, there is further stringency of only 4 ppb total and 2 ppb B₁ aflatoxin. India has currently set 30 ppb as the permissible limit. In order to achieve such a stringency of quality, it is estimated that nearly 90 per cent of the nuts should be removed in sorting alone. The cost of such effort would be stragging. India is a major supplier of the referred nuts and is bound to be hard hit, which in our view is far from being fair. It is heartening to know that Indian Diplomatic mission to the European Union has already taken up this issue to do what it can, to alleviate the situation.

Indian scientists need to take up the aflatoxin problem on a war footing and get at the facts and get them fast. There ought to be a coordinated effort of the plant breeders, biochemists, microbiologists and toxicologists. I have always wondered about nature's provision to handle toxic factors that pose a threat to the living cell. Does the cell possess counteracting or neutralising factors, biological, chemical or physical to overcome aflatoxin? Better knowledge would enable us to set more practical tolerance limits of aflatoxin in foodstuffs with total assurance for consumer safety.

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INDUSTRY NEWS

EU's Reduction in Aflatoxin Levels May Hit Indian Exports

India's exports to the 15 nation European Union (EU) of groundnuts, cashew nuts, walnuts, pepper and oilcakes are under threat. In a purported attempt to protect the health of EU consumers, the European Commission has proposed very low permissible levels of aflatoxin, a cancer causing substance present in mould.

The levels set by individual EU countries are already much below those set by the main supplier countries, such as the United States, China, India, Vietnam and Argentina.

The Commission's proposal, if adopted, would be applied across the EU.

Where the product is not for direct human consumption, the European Commission has proposed a total permissible level of 10 parts per billion (ppb), of which the B1 aflatoxin cannot exceed 5 ppb. For products meant for direct consumption like shelled nuts, the proposed total level is 4 ppb, the B1 level 2 ppb. India has set the B1 level at 30 ppb, China at 20 ppb. Neither has set total levels. The US has set only a total level of 20 ppb, as have Vietnam and Argentina.

India's diplomatic mission to the EU has already taken up this potential threat to Indian exports with the European Commission, the EU's executive arm in Brussels. European groundnut importers have joined the chorus of protests,

as the cost of imported nuts would rise substantially.

A US study has estimated that the additional sorting would remove 80 to 90 per cent of nuts, including 75 per cent of uncontaminated material.

India is a major supplier of unshelled groundnuts, mainly to the UK. It is the largest supplier of cashew nuts, with 81 per cent of the market, and walnuts, with a 27 per cent market share.

It is the second largest supplier of pepper (12 per cent market share), and the fourth largest supplier of oilcakes (6 per cent market share).

An FAO/WHO committee believes that there is insufficient evidence to set tolerable intake levels.

It is claimed that if the total level is reduced from 20 to 10 ppb, the risk factor would fall by just two additional cancers for a population with EU living standards of one billion.

CII Suggests Futures Trading Board, Corporate Agriculture

The Confederation of Indian Industry (CII) has recommended the introduction of corporate agriculture through contract farming, which would result in higher private investments in the agriculture sector as well as the setting up of futures trading board to cover all

major commodities.

The CII, in its agenda for agricultural reforms, prepared by the Rajan Nanda Committee, has formulated a golden triangle model on corporatisation of agriculture comprising the corporate sector, bankers and farmers. This model, indicates a basic structure on which the corporatisation of agriculture would be feasible and become a growing phenomenon in the coming years of globalisation.

As per this model, corporate cultivation will be practised on the basis of contract farming. The farmer will provide land and labour, the corporate will provide inputs to the farmer and the banker will provide credit and financing. The corporate will enter into a contract with farmer to purchase his produce at a pre-determined price. Further, the corporate will market the produce in the domestic and export markets and will also do the entire spade work on behalf of farmers for credit and financing needs.

According to the CII report, high and growing input subsidies for fertiliser, electricity and irrigation are fiscally unsustainable, highly inequitable, concentrated in the richest states and among the richest farmers. Further, subsidies have little impact on reducing net non-protection of agriculture and remains only a modest proportion of production cost.

CII has recommended that subsidies on electricity and irrigation be reduced gradually and that the government should follow a phased programme to reduce budget subsidy for fertilisers and also restructure the fertiliser industry to increase competition.

Advocating the liberalisation of agricultural markets, CII has suggested that the FCI should reduce its direct role in purchasing, transporting and storing grain and at the same time, reconsider concentrating its own intervention in areas where price support would encourage production.

The chamber said that all control on free movement, stocking limits and future trading must go in the long run and government should gradually allow open market pricing policy. The government should also invite the private sector to build large storage and distribution operations for domestic and export markets.

On the issue of restructuring rural credit, the CII has stated that the time has come to withdraw concessional rates of interest for agriculture within a period of two to three years.

World Bank to Fund Indian Agro-tech Project

An Indian project to improve agriculture technology development and dissemination of information to farmers will receive a \$196.8 million boost from the World Bank.

"With more than 80 percent of India's poor living in rural areas, boosting agricultural growth is critical to raising rural incomes and living standards", a Bank official said.

The project will find the fund for the first five-year slice of a long-term programme to revitalise national systems for technology generation, assessment and dissemina-

tion so that India can stay at the scientific forefront and spur productivity.

The Bank said that India's national agricultural support project aims to update government access to latest developments in agriculture and agricultural technology worldwide through on-line access to database and scientific literature, and improve dissemination of the information to farmers.

Priority-setting mechanisms and a shift in research orientation would also give greater attention to issues affecting sustainability of production systems, yield stagnation and rain-fed agricultural productivity.

Industry Chambers Urge Legislation to Protect Genetic Resources

Industry chambers have urged the government to immediately put in place all national legislations that can be enacted under the World Trade Organisation agreement to safeguard India's key genetic resources and protect Indian producers.

Reacting strongly to the US Patent Office granting a patent for basmati rice to a US company, a leading industry described the development as "most shocking". He said that the government and industry should take up the matter in all seriousness and without any delay, to protect India's interest, particularly growers and exporters.

The Confederation of Indian Industry (CII) said that it is unfortunate that the US has granted pat-

ent for basmati rice to Ricetec, as basmati rice is a product which is Indian-bred and originates from a particular region of India.

"India's interest must be safeguarded against the vulnerability, which developing companies are subject to, from developed countries. India must be vigilant and undertake necessary legislative measures to safeguard and protect its interest.

The Federation of Indian Chambers of Commerce and Industry (FICCI) also reacted sharply on this issue and termed this episode as 'deeply disturbing'. The chamber said that offering patent to Basmati is a total distortion to the very spirit to patent, which is meant for scientific discovery that spurs innovations. FICCI has requested the Indian Government to evolve a strategy to protect our cultural and traditional heritage, which has nothing to do with modern concept of scientific discovery.

Downturn in Corn, Grain Exports

Waning world appetite for grain will slow down US corn and wheat exports, leaving larger stock piles that would be a cushion against a poor harvest this year.

In a monthly update, the US Department of Agriculture (USDA) pegged corn exports at 1.525 billion bushels for the sales year ending September 1, the lowest in four years.

A slowdown in sales will translate into larger US stockpiles and constrain prices. Farm-gate prices for wheat, corn and soybeans were projected to run 20 cents to 90 cents a bushel below the average

paid for the previous crop.

The USDA estimated 1.21 billion bushels of corn would be on hand at the end of summer, 27 per cent more than it forecast in March. The wheat stockpile was put at 726 million bushels, up 8 per cent from a month ago.

Soybeans were the bright spot in the Agriculture Department's report. It forecast a record 1.525 billion bushels of soybeans would be crushed to make soymeal and soyoil. Soyoil exports were estimated at a record 2.9 billion pounds and soymeal exports at a near-record 7.9 million short tonnes.

US Keen on Exporting Soybean

The United States soybean exporters are keen on supplying soybean to India on a long-term basis. They have proposed to provide necessary assistance in resolving any issue of potential phytosanitary and economic risks of plant pathogens on imports of the US soybeans in the country.

The question of oilseeds imports in the country has gained importance with domestic oilseeds production remaining stagnant, facing large amount of import of edible oils to bridge the supply-demand gap. The processing industry, has suggested allowing imports of oilseeds like soya, sunflower, rapeseed and even ricebran under OGL.

Though the Centre is considering such imports, the issues raised by the agriculture ministry on likely phytosanitary problems are coming in the way. As the need for importing oilseeds in the coun-

try becomes more apparent, the American Soybean Association (ASA) is doing rounds at the association and at the ministry-level.

India Lifts Ban on Soybean Imports

After two years of intense lobbying by the US, the Union Government has agreed in principle to lift the ban on soybeans import and permit Indian processors to bring in one million tonnes.

The final decision and formal notification stating the terms and conditions of imports, especially the duty and phyto-sanitary requirements, is expected by the new government at the centre.

The commerce ministry, under the previous government, had already recommended duty-free imports of soybeans during the nine months outside the harvest season and asked the agriculture ministry to establish more "practical" phyto-sanitary requirements on imported beans, industry sources said. At present, India levies an import duty of 45 per cent on soybeans.

Soybean import and their phyto specifications have been a bone of contention between India and the US from February 1995 onwards, when India last permitted duty-free imports of beans by private crushers subject to meal re-export requirements. In response to this policy, imports of around 55,000 tonnes, all from the US, took place.

However, the consignments ran into trouble when the Directorate of Plant Quarantine, under the agriculture ministry, insisted that the shipments will be cleared only after grow-out trials (needing 45

days) to check for certain viral diseases. This effectively banned imports of beans. Since then, the US foreign agricultural affairs office and the American Soybean Association (ASA), in collaboration with the Indian soybean industry, has been lobbying for relaxation of the phyto-sanitary criteria for imported soybeans. The US is the one of the world's largest exporters of soybean.

Higher Soybean Harvest Envisaged This Year

A three lakh hectare rise in area under Soybean cultivation and timely monsoon are likely to increase Soybean output this year, a preliminary survey says.

Area under cultivation has gone up to 61 lakh hectares this year from last year's level of 58 lakh hectares, with Madhya Pradesh accounting for 43.8 lakh hectares, the survey conducted by VMA oilseeds Research and Development Institute.

Institute Director Dr.Gyan Singh told that increase in area under cultivation and good monsoon had brightened the prospects of a healthy crop. The total Soybean yield could go up to 60 lakh tonnes.

He said that almost 80 per cent of traditional land was brought under Soybean cultivation and the extent of fallow land brought under for cultivation had more than offset the marginal shift to other crops.

Acreage under cultivation in all the three major Soybean producing states - Madhya Pradesh, Maharashtra and Rajasthan, has increased, the survey said.

Nilgiri's to Sell Packaged US Dry Green Peas in South India

Nilgiris chain of stores, a unit of The Nilgiri Dairy Farm Ltd, plans to sell packaged American green peas through its retail network. The company has entered into an agreement with US Dry Pea and Lentil Council to sell the US grown dry peas in South India. The American council was formed in 1965 to create awareness about the American green peas, so as to enable the growers to reach markets worldwide.

The agreement with the council will enable Nilgiris, which has always stood for quality, to import high quality dry peas from the US and sell them in special pouches in all our franchise outlets.

The company is also organising public awareness programmes in Chennai, Pondicherry and other places to promote the product.

The council is a trade association with membership consisting of farmers, processors and exporters. Nearly 6,000 growers, 20 processors and about 15 exporters from US make up the current membership of the council.

The council has five overseas offices situated in India, Spain, Thailand, Japan and Hongkong. It takes the responsibility of marketing the three products; dry peas, lentils and chickpeas.

Nearly two lakh tonnes of green peas, 1.8 lakh tonnes of lentils are produced every year in the US.

Around 75-80 per cent of green peas produced in US is exported.

Next Green Revolution to be in Maize

The green revolution of the next century will be in the area of maize, Nobel Laureate Norman E Borlaug has predicted.

"By 2000-2005, maize production will herald the 21st century's Green Revolution," Borlaug regarded as the father of the Green Revolution in the 60s, told a press conference organised on the occasion of the signing of the fourth work plan of the Indian Council of Agricultural Research (ICAR) and Mexico-based International Centre for Maize and Wheat Improvement (CIMMYT).

Africa is not the most critical area of food shortage, similar to South Asia and South East Asia 35 years ago, Borlaug said.

Borlaug was working on a Rockefeller Foundation supported project that evolved into CIMMYT later. The 24-year-old ICAR-CIMMYT collaboration has led to introduction of high-yielding dwarf Mexican wheats into India, which were hybridised with local varieties to usher in India's green revolution and self-sufficiency in food production. Borlaug said maize has the highest genetic yield potential among the cereal crops and can be grown in diverse climatic conditions from the cold weather in the north to tropical climate.

Maize has been shown to grow even in acid soils of Brazil and can be extensively cultivated in problem soils of Africa that is facing severe food shortage currently, the Nobel laureate said.

Praising India for its tremendous achievement in agricultural production, Borlaug stressed the

importance of buffer stocks for food security.

India also received a pat on its back from Tomothy Reeves, CIMMYT director, who said that by any international standards, "what has been achieved in India agriculturally is outstanding".

"India is a jewel in the crown, an example of the need to invest in agriculture," Reeves told journalists.

EIC Clears 4 More Marine Products Export Units

The Export Inspection Council (EIC), a wing of the commerce ministry, has cleared four more marine products units for exports to the European Union.

With this, total number of units cleared by the Council for exports has gone up to 14. The EIC has been empowered to clear units for exports to the products from August 1 last. The ban was lifted after the EU received a list of 10 units, which fully conformed to the Union standards of food hygiene and safety. EIC also sent a letter of guarantee on the efficiency of its inspection, monitoring and control system.

In all, 45 units had applied for exports to the EU and these were being inspected through an inter departmental panel comprising officials from export inspection agencies, Marine Products Export Development Authority (MPEDA) and Central Institute of Fisheries Technology.

The panel was constituted by the Government to inspect and

recommend units, which permit export to EU.

EU had banned Indian marine products after it found deficiencies in hygiene in some of the consignments. The deficiencies were noted by a team of EU experts who visited India.

Soon after the ban, the commerce minister revamped the export inspection procedures and systems besides gearing up the EIC and its agencies.

NABARD Suggests Rs. 18-crore Investment in Karnataka Fisheries Sector

The National Bank for Agriculture and Rural Development (NABARD) has identified several infrastructure gaps in fisheries sector in Karnataka. In its State Focus Paper (SFP) on ground level credit flow for the state for 1998-99 to be released shortly, NABARD has given some suggestions to the state for the overall development of fisheries.

Out of Rs. 4,966.53 crore potential linked credit plan for "agriculture and allied activities" in Karnataka for the year 1998-99, NABARD has projected an investment potential of Rs. 18.39 crores for the fisheries sector.

Stressing that the state has immense potential for investment in both marine and inland fisheries, the Bank has suggested for introducing new technologies in the sector, such as rearing of fish farming,

construction of fish seed rearing units, fresh water prawn culture by mono or poly culture with intensive carp culture and mariculture activities like edible oyster culture, mussel culture (only in coastal districts) and development of waterlogged areas.

There is an urgent need to set up more seed production farms, hatcheries and seed rearing farms, as the state requires approximately 50 crores of fish seed annually to develop the vast inland water resources.

Presently, these resources are not fully developed on account of non-availability of adequate quantity of fish seed (stockable size).

Karnataka has a large number of water-logged areas and saline lands existing in the command areas of the irrigation projects. These are not suitable for growing agriculture crops. Pisciculture can be taken up profitably in these areas.

American Food Safety Norms Mooted for US Fruit and Vegetable Imports

The United States should halt imports of fruits and vegetables from countries that do not meet American food safety standards in order to protect consumers from illness, a report to Congress said.

The recommendations were immediately endorsed by President Bill Clinton and Democrats who have pushed for tougher food laws, as well as by Sen. Susan Collins of

Maine, the first Senate Republican to focus on the issue.

But imposing US inspection standards on other nations could trigger a backlash from trading partners, some industry groups claimed.

The report, prepared by the General Accounting Office, said that the Food and Drug Administration should require exporters to adopt "equivalent" safety standards for fruits and vegetables, much like the Agriculture Department does with meat.

As many as 9,000 Americans die annually from foodborne disease, and tens of thousands of others are sickened, according to federal estimates.

A variety of proposed laws to give the FDA and the Agriculture Department more authority have been proposed by Democrats during past few months. Clinton repeated his call for legislation that would send FDA inspectors to foreign countries to halt imports of unsafe produce. The FDA called the report a 'wake up call' for congress to allocate additional funds for FDA inspectors.

Canned Vegetables, Fruits Get 'Healthy' US Certification

Frozen and canned fruits and vegetables may be labelled and sold as 'healthy' foods according to the US Food and Drug Administration (FDA). Some enriched bread products can also carry the label.

The new rule is designed to

encourage greater use of foods whose consumption is recommended in the US dietary guidelines as important for the maintenance of good health.

It said that the industry had proved that frozen and canned vegetables can contain as many nutrients as fresh ones and sometimes more.

The American Frozen Food Institute (AFFI) presented as evidence a study that found frozen green beans contained twice as much vitamin C as fresh raw beans.

The National Cancer Institute recommends eating at least five servings a day of fruits and vegetables and more if possible. Heart disease experts also recommend eating a diet based on plants and grains.

In 1994, the word 'Healthy' could be used on labels if the food was low in fat and saturated fat, sodium and cholesterol and contained at least 10 per cent of the daily recommended serving of vitamins A or C, calcium, iron, proteins or fibre.

Long-term Policies Mooted for Indian Oilseed Sector

India must sharp productivity and tap non-traditional sources to bolster its oilseeds output, industry officials and analysts say.

But breaking the industry out of its near-stagnation will be a long process, requiring the government's help.

India could produce more of its own edible oil, if it had more irrigation, better farm finance and

policies that stopped encouraging the planting of other crops.

India's main oilseed crops are rapeseed, mustard, soybean and peanut but officials said that the industry should examine such alternative as rice bran and cotton seed.

Even imported oilseeds, currently prohibited, would help fill unused crushing capacity.

Oilseeds and their products are among India's largest industries, accounting for about three per cent of the country's gross domestic product. India's annual oilseeds output has been stagnant over the years at about 22 million tonnes a year. It fell to 21.33 million tonnes in the 1997-98 (Nov.-Oct.) season from 21.63 million a year before.

India has an oilseed-crushing capacity of over 36 million tonnes and about 30 million tonnes of solvent-extraction processing capacity.

The country harvests two oilseeds crops annually, with the bulk of the output coming from the winter crop.

India imports more than 1.5 million tonnes of edible oil annually, the bulk of it from Malaysia. The industry must try to tap non-traditional sources of oil, such as rice bran oil, cotton seeds oil and minor oilseeds.

Wheat, Rice Buffer Stocks More Than Adequate

Buffer stock position for wheat and rice is comfortable. According to buffer norms for central pool, both wheat and rice together

have to be 14.5 million tonnes as on April 1, 1998. Out of which wheat should be 3.7 million tonnes and rice 10.8 million tonnes.

As against this, the food stocks in the central pool as on February 28, 1998 was much higher at 18.73 million tonnes, comprising 5.95 million tonnes of wheat and 12.78 million tonnes of rice.

Rice production this year is expected to touch 73.13 million tonnes against the last year's output of 71.52 million tonnes. The buffer stock requirement for rice as on January 1, 1998 is 7.7 million tonnes. However, estimating wheat production is much of debate today. The procuring agency like Food Corporation of India (FCI) is gearing up before the arrivals of new wheat crop in the first week of April 1998.

India harvested a record wheat crop of 68.71 million tonnes in 1996-97, up from 62.6 million tonnes in 1995-96. India has so far imported 2.25 million tonnes of wheat in 1997-98. Unseasonable rains in November delayed sowing operations in some regions and the area under wheat crop had dropped to 25 million hectares in 1997-98 from 26 million in 1996-97.

Foodgrains Target Set at 210 mt for 1998-99

In keeping with the Prime Minister A. B. Vajpayee's objective to doubling foodgrain production in a decade, the agriculture ministry has agreed to make efforts to achieve a foodgrain production target of 210 million tonnes in 1998-99.

The decision was taken at the

national conference on agriculture for kharif campaign after which agriculturists and officials from across the country passed a set of resolutions to achieve this objective.

Interestingly, this ambitious target has been set after down-sizing the current year's production estimate to about 195 million tonnes.

In the agricultural year 1998-99, a target of 27 million tonnes has been set for oilseeds, 14.8 million bales of cotton and 300 million tonnes of sugarcane.

A strategy for adoption of area specific varieties of crops and technology is to be given complete attention by the states.

The Union agriculture ministry has agreed to expeditiously pursue the rehabilitation package for cooperatives to enable them to ensure adequate and timely credit. The states have also agreed to make timely use of funds released by the Centre.

The meeting endorsed the decision to replace the experimental crop insurance scheme by the modified comprehensive crop insurance scheme by the next rabi season. The proposed modified scheme is to be formulated in consultation with financial institutions and also the state governments.

Consensus was reached on critical issues effecting integrated watershed management development programmes which is the main focus area of agriculture and timely found flow, greater transparency, bottoms up approach to planning and implementation and large physical coverage of rainfed area on watershed basis were some of the suggestions to strengthen the water shed development programme.

To ensure quick decision making, it has been decided to use Nicnet to allow timely submission

of reliable estimate of crops, weather and price statistics to the central ministry.

Godrej Foods' Mysore Unit to Go Commercial

The Godrej Foods Limited is planning to commence commercial production at its fruit drink manufacturing plant in Mysore. The Mysore unit will be the company's second unit to manufacture the 'Jumpin' range of fruit juices. The other unit is located in Madhya Pradesh. The Mysore Unit has facilities to manufacture from the pulp to the packaging stage.

The Unit, which is being set up at an estimate cost of about Rs. 15 crores, has an annual capacity of about 30 lakh cases -- each case consisting of 27 packets.

The Mysore unit will mainly cater to the Southern market. The South Indian market accounts for about 30 percent of the company's fruit juice sales.

The company plans to source some of its fruit pulp requirements for the Mysore unit from the southern states.

Scientists Nudged to Develop Caffeine-free Coffee

Genetic manipulation using techniques of tissue culture and molecular biology, can allow scientists to create a caffeine-free coffee

plant, according to Dr. Manju Sharma, secretary, department of biotechnology, Government of India.

Scientists must, she said, help in tapping the potential market for decaffeinated coffee which was expected to increase rapidly.

The department of biotechnology had already provided support to the Central Coffee Research Institute (CCRI), Balehonnur, for propagation of coffee varieties. Good leads had been obtained and the protocol was being evaluated at the field-level and was likely to be of great commercial importance.

The conventional process had limitations for coffee improvement due to long breeding cycles, the genetic barrier of chromosome, number differences and auto-incompatible alleles (diploid species).

As a result, the release of a new variety using conventional techniques was slow process, taking a minimum of 24 years of continuous breeding. Biotechnology, besides being useful in overcoming this problem, could also help in overcoming certain other limitations of conventional breeding techniques. Dr. Sharma said. Clonal propagation of improved varieties could play a significant role in increasing productivity.

Bees Help Boost Crop Yields

Honey apart, bees are being used by many countries to enhance crop yield, but India is yet to tap this potential.

Had India paid enough attention to utilise the services provided by bees, it would have helped it become self-sufficient in oilseeds and pulses production.

The other crops that could benefit from bees are onions, beans, coffee, alfalfa, grapes, oranges, litchis, apples and plums.

Bees help improve production in self sterile plants that depend on outside agents such as wind, insects, birds and water to disperse pollen.

By conservative estimates, edible oil production would have touched 37 million tonnes, an increase of 66 per cent over the current output. This would have made India one of the largest exporters of edible oil instead of an importer.

It is estimated that the US earn about \$ 8 million annually due to enhanced crop production from bee pollination.

Similarly, Malaysia became a global leader in the production of palm oil within a decade after the introduction of weevil, an insect, for facilitating pollination.

It says countries like China, Mexico and Argentina are far ahead of India in apiary exports.

Though rapid developments have taken place in bee science in other countries, it is in a mess in India, though the national commission for agriculture has recommended its promotion two decades back.

Bee research is in a neglected state with severe dearth of researchers. There are a dozen scientists who are working on bee-related branches and readily switch to other subjects.

Bee science is conspicuously omitted from the list of subjects covered under Indian Council of Agricultural Research (ICAR).

The only bee research institute located in Pune has been allotted under the khadi and village industries which has "no science or re-

search background".

Indiscriminate use of pesticides, chemicals and intensive farming practices in recent years have caused a steady decline in natural pollinators inhabiting soil, making "pollinator management" even more important.

Bees can easily fill this void as they have finely branched hair that can trap thousands of pollen grains during their search for nectar.

They transfer pollen as they hop from one plant to other.

Unless pollination is aided by providing bees in self-sterile plants, the reports says "any amount of fertiliser or other measures may not give even a fraction of their potential yields".

In field trials carried out in Punjab, moving bee hives in sunflower fields produced yield 300 per cent in excess of the average, which is 'unequalled by any other crop, even rice or wheat for which it is reputed'.

Foodgrains Output Down By 4 mt in 1997-98

Foodgrain production for the current agricultural year (1996-97) is estimated to be nearly, four million tonnes below last year's record production of 198 million tonnes. A setback in pulses and coarse cereals production is responsible for the decline.

Foodgrain production was pegged at 200 million tonnes in the initial estimates, but truant weather made agriculturists rethink that figure. The deliberations with the

states, which took stock of prospects for the crop production for the year 1997-98 concluded that the agro-climatic conditions were not favourable to certain crops. Delayed monsoon in different parts of the country followed by rainfall slightly above normal caused a setback in the production of coarse cereals and oilseeds, particularly in Maharashtra and Andhra Pradesh.

Resowing of wheat crop in parts and delayed sowing in others also led to a decline in the wheat crop expected to total 66.5 million tonnes as compared to last year's record 69.3 million tonnes. However, there is cause to cheer with the paddy crop, which is estimated at a record high of 83.5 million tonnes.

Pulses production at 13 million tonnes, and coarse cereals at 31.2 million tonnes is lower by a million tonne from last year's 14 million tonne for pulses.

Oilseeds production is expected to be about 24 million tonnes, also one million tonnes down from last year.

While groundnut, rapeseed and mustard production is on the decline, a record soybean production at 6.5 million tonnes is expected.

Sugarcane production in 1997-98 was likely to be 26 million tonnes, about 17 million tonnes lower than last year.

A proposal for comprehensive crop insurance scheme for rabi 1998-99 has been endorsed after a review of the experimental crop insurance scheme started by the previous government.

Plus Points of Oilseed Imports

It is economical during certain periods of time to import oilseeds rather than oils.

While oil can be retained for domestic consumption, oilmeal can be exported to earn foreign exchange.

The state governments will benefit by collecting additional revenue by way of sales tax and octroi at an average of 10% from oil, oilcake and other by-products.

Oilseed imports do not envisage any loss of revenue to the exchequer. The revenue generated through levy of custom duty on edible oil import will be compensated through collection of sales tax, octroi and other taxes.

The solvent extraction and oil milling capacity utilisation will improve from the present level of 30 to 35% to about 50%.

Additional employment opportunities will be generated and trade and commerce will improve.

Price fluctuation in the domestic market will be arrested and will lead to better stability in prices of edible oils.

Sunflowerseed crop is hardly 1.5 million tonnes against total oilseeds crop of 24 million tonnes (6%) and also the crop is spread over number of states and hence will not have any adverse impact on farmers and particularly the price of locally grown sunflower seed.

Sunflowerseed import will not hurt the growers of sunflowerseed as it will only partly replace sunflower/edible oil imports.

Farmers are only using hybrid seed of sunflower for sowing and

therefore imported sunflowerseed for crushing will not be used for sowing.

As far as quarantine problem is concerned, sunflower seed does not fall under high PQ risk category.

Trends in Garlic Trade

Garlic exports during April 1997-January 1998 were 2,770 tonnes valued at Rs. 6.13 crores against 4,114 tonnes valued at Rs. 6.03 crores in the same period of 1996-97.

India, once a market leader, is losing out in the foreign market against China, the current market leader. For 1997-98, China's crop is good and so also the quality. It is better packaged (in cartons) and is price competitive. Besides, Chinese garlic flakes are thicker unlike those of the Indian garlic, which are thinner. Hence, greater demand for Chinese garlic.

The factor that goes against Indian exports is the cost of production and packing is high as compared to China. Traders feel that India does not sustain or maintain its quality in exports -- while a few consignments of garlic may maintain all the required international quality standards for exports, the next lot may be disappointing or substandard.

The export target set for 1997-98 is 8,000 tonnes valued at Rs. 16 crores. This year, the Indian production is also up by nearly 50 per cent. The normal production is around one crore bags of 50 kg each. Exporters hope that if the prices remain competitive, because of expected higher production, exports next year may increase sub-

stantially.

The main garlic producing centres are MP, UP, Rajasthan and Gujarat. The speciality of Rajasthan garlic is that the flakes are big and the flavour good. In Ooty and Kodaikanal, garlic of very good quality is grown in limited quantities. This garlic is produced and consumed locally. Of late, garlic paste and powder are also being exported.

Maximum garlic exports are from Bangalore, which is the main centre for buying and selling of garlic. From Bangalore, garlic is exported to Malaysia, Singapore and Sri Lanka via Tuticorin and Chennai ports.

APEDA Chalks Out Plan to Boost Agri Exports

In order to popularise various agricultural products from South India and step up their exports to the far-eastern Asian markets, the Agricultural and Processed Food Products Export Development Authority (APEDA) observed a "Product promotion week" in Singapore and Hong Kong.

The agricultural products identified to be promoted during the week included mangoes and grapes (in Singapore), and bananas, mangoes and grapes (in Hong Kong).

APEDA has selected Bangani-palli and Suvarnarekha varieties of mangoes and export quality table grapes (seedless), from Andhra Pradesh for popularising them in Singapore and Hong Kong. As part of product promotion programme,

the APEDA, which is an arm of the ministry of commerce, government of India, is also holding a 'buyers-sellers' meet in these two countries.

While the first one in Singapore began on May 20 and would go on till 22, the second meet in Hong Kong was on May 23 and closed on 26th of the same month. After the end of the meet in Singapore, there would be an "in-store promotional drive" from May 24 to 28, wherein the products would be placed in various departmental stores for kindling awareness amongst the consumers.

"Exporters of agricultural products have been traditionally concentrating on the middle-eastern and European markets. We want to open new ways to the huge far-eastern markets, and help the exporters, exploit them in due course," the officials remarked.

Palm Oil Prices Likely to go Down, Say Indian Traders

India's edible oil industry welcomed Indonesia's decision to lift a ban on crude palm oil exports because it would mean lower prices, but they said that the cheaper imports would not last long.

Indonesia said that it would lift the export ban on crude palm oil and replace it with an export tax of not more than 40 per cent. Indonesia had banned crude palm oil exports in January to stabilise domestic prices, which have been soaring because of the tumbling rupiah.

The ban has pushed up Malaysian palm oil price because it is the only global palmolein oil sup-

plier after Indonesia. Malaysian palmolein oil is currently quoted at \$700 per tonne (C & F) at Indian ports. Indonesia has also said that the export tax would be reviewed regularly for possible reduction based on market prices and the exchange rate, and cut to 10 per cent by the end of December 1999.

Indian trade officials said that the 40 per cent duty imposed by Indonesia would not be disincentive to Indonesian exporters because they would be able to export at a lower price, since their stocks had accumulated after the ban. With stocks having piled up, Indonesian traders might reduce their price and export. But industry officials said global edible oil price would remain supported for at least six months as Malaysian palm oil output was expected to fall in 1998. Argentina's sunflower oil output was also expected to be less because of poor weather.

Traders expect palmolein oil prices to ease at least Rs. 1,000 a tonne from 32,200 at present. India imported about 1.7 million tonnes of edible oil in the 1996/97 (November-October) season, out of which nearly 1.2 million tonnes came from Malaysia and 400,000 tonnes from Indonesia. Trade officials said that India's demand was growing but high prices in current season would reduce consumption and as a result, imports would fall.

ICAR to Raise Oil Palm on 10 Lakh Hectares

The Indian Council for Agriculture Research (ICAR) Director General Rajendra Singh Paroda has said that a massive programme would be implemented to raise oil palms in ten lakh hectares in the

country in the next ten years. Speaking at the oil palm growers meeting at the National Research Centre for Oilpalm (NRCOP) at Pedavegi, he hoped that production of oil palm would go up to three to four million tonnes by the year 2020. However, non-availability of adequate power supply to farm pumpsets acted as a constant, he added.

He said though the Eighth Plan envisaged to bring 80,000 hectares under oil palm cultivation in Andhra Pradesh, Karnataka, Tamil Nadu, Goa, Gujarat, Orissa and Assam, only 41,000 hectares could be covered under the oil palm development programme. Referring to the failure of cotton crops in the state which led to a spate of suicides by farmers, Dr. Singh said that heavy usage of pesticides, adverse weather conditions and non-application of modern methods of cultivation were among other reasons for the failure of cotton crop.

Groundnut Oil Zooms, Touches Rs.496 per 10 kg

Groundnut oil rose by Rs. 8 per 10 kg to touch a historical high of Rs. 496. Arrivals remained restricted to 40 tonnes. Sunflower solvent refined moved up by Rs. 3 to 450 and palmolein by Rs. 2 to Rs. 378 per 10 kg. In Mumbai, castor-seed opened at Rs. 1,434 per quintal from thursday's close of Rs. 1,435. The contract recorded a low of Rs. 1,434 and a high of Rs. 1,441 and closed at Rs. 1,438 per quintal. In Gujarat, castorseed arrivals remained restricted to 15,000 bags and was up by Rs. 2 at Rs. 280-282 per 20 kg. Castor oil moved up by

INDUSTRY NEWS

Re.1 to Rs. 306 per 10 kg. In Ahmedabad, castorseed opened low at Rs. 1,429 per quintal from its close of Rs. 1426.50. The contract closed at a high at Rs. 1,445 per quintal.

BIS Moots HACCP, ISO 9000 For Food Processing

Additional Director General
of the Bureau of Indian Standard

(BIS), B Mukherji, called upon export-oriented food producing units to go for hazard analysis critical control points (HACCP) and HACCP based ISO 9000 certification as quality and safety had become the competitive edge for better acceptability of food items in global market. Inaugurating an awareness programme on HACCP in Ahmedabad, Mukherji said BIS had started giving HACCP 9000 certificates to food industries. Mother Dairy in Delhi and Punjab Co-op Milk of Chandigarh had got the certification in the last two months, he added.

Mukherji said that the units which were not ready to go for ISO 9000 could apply for only HACCP standard. Food industry had a major share in the export from the country and to avoid non-tariff barriers, Indian exporters should go for HACCP and ISO 9000 certification, he said. All over the world, the trend was for increasing emphasis on food safety.

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Status of Rice Bran Oil In India

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Status of Rice Bran Oil In India

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Abstract

National scenario of rice bran, in terms of rice bran processed, total oil, edible oil, industrial oil etc. was monitored for a period of 20 years. i.e., from 1974-75 to 1993-94. Over the years, the country has witnessed considerable change in the rice bran oil scenario. The quantities of bran processed and total oil yield have increased almost 17 times during the last 20 years. A breakthrough in the production of edible grade rice bran oil was made by the industry in the year 1978-79 in which 2500 tonnes of edible oil were produced for the first time. The production of edible oil has been consistently increased since then, to a level representing about 60% of the total oil yield. The trend of the parameters could be mathematically analysed through regression yielding appropriate models. However, the solvent extraction industry is processing only 50% of the total bran produced, mainly because, huller bran is not available to the industry. Possible strategies for further improvement through involvement of industry and government have been suggested.

Introduction

Rice bran, a by-product of rice milling industry has been an important raw material for solvent extraction industry. On an average, rice bran contains about 16% oil. With an annual production of nearly 100 million tonnes of paddy in India, (FAO 1990) rice bran availability, at a rate of 5%, is of the order of 5 million tonnes and with

16% oil content in bran, potential rice bran oil availability should be 800,000 tonnes of oil, whereas the current production of total rice bran oil is 407,456 tonnes out of which,

Rice bran, a by-product of rice milling industry, has been an important raw material for solvent extraction industry.

edible oil is only 230,917 tonnes, indicating a wide gap between potential and production of oil. In fact, during 1992-93, India imported 360,000 tonnes of edible oil at a cost of Rs. 45.34 crores (Anon 1994). Thus, if potential could be fully exploited and edible grade oil production is encouraged, additional oil production could be fully exploited and edible grade oil production is encouraged, additional oil production could considerably reduce the import and

The plants which are located within the vicinity of a cluster of rice mills are better placed to produce edible oil compared to those away from such clusters.

even make India, an exporter of edible oil. This would alter the edible oil scenario of the country.

Although, the data presented above indicate a promising picture, there are difficulties in realizing the full potential of rice bran oil. Bran produced by modern rice mills is extractable by the solvent extraction industry, whereas the bran produced by hullers is of inferior quality containing a mixture of bran and husk and as such, this bran presents major problems in extraction of oil. Moreover, the collection of bran from such mill systems is not only difficult and cumbersome, but also an expensive proposition, since these units are of small capacity and are scattered all over the country, particularly, in rural remote areas. At the same time, rice bran is not a very stable material as the FFA content of the bran rises rapidly during storage and the time consumed in the collection of bran from a wide area would render the oil unsuitable for edible purpose. Under the prevailing constrained circumstances, the solvent extraction industry, even with whatsoever bran reaches the plant, it is not in a position to produce all of its oil of edible grade due to quick rise in FFA, resulting from distance transportation. The plants which are located within the vicinity of a cluster of rice mills are better placed to produce edible oil compared to those away from such clusters. In fact, high quality edible grade oil can be produced, if rice bran is processed within 24 hours, of its production or from stabilized bran. The present technology of rice bran stabilization is not very popular due to a variety of reasons and, therefore, quick collection and

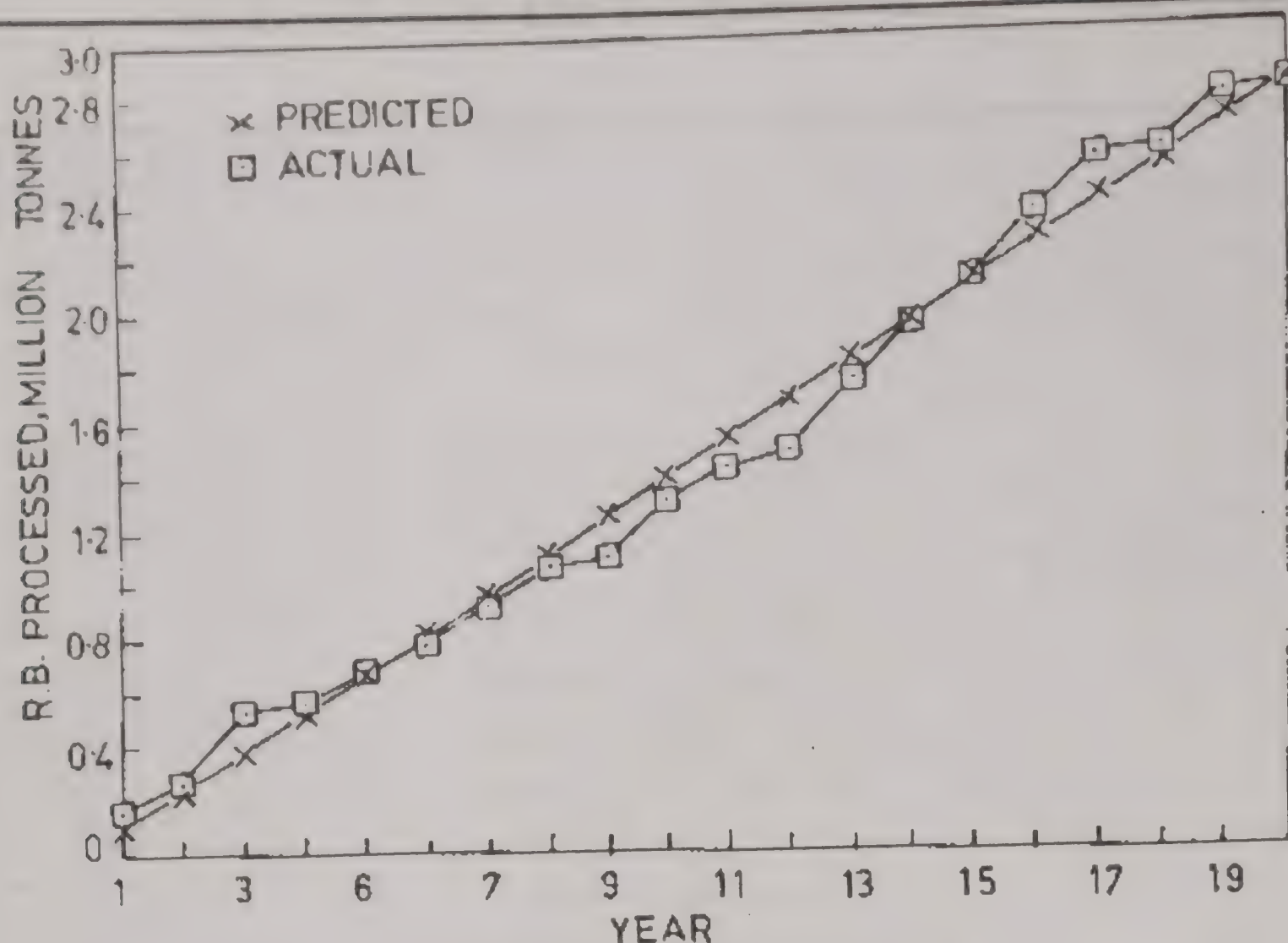


Fig.1. Rice Bran Processed during 1974-1994

processing approach appears to be a promising alternative. Nevertheless, country is already producing edible grade oil. This paper presents an analysis of trends in production of edible, industrial and total oil from rice bran for a period of 20 years from 1974-1975 to 93-94.

Approach

Data on the processing of rice bran were collected from annual publication (1993-94). Solvent Extractor Association and discussion were held with the members of the associations and with the solvent plant personnel. The pattern of the changing scenario with respect to time was mathematically modelled using Lotus Software on 386 microprocessor system. Error analysis in terms of maximum error (E_{max}), and error corresponding to 92% (E_{92}) of data points were estimated through comparison of predicted and published data. Handling losses in the system were also analysed through material

balance.

Status

The data on rice bran processed, total oil yield, edible oil and industrial oil, deoiled cake,

In spite of the increase in the availability of rice bran to the solvent extraction units, the full potential of rice oil, estimated at 80000 tonnes, has not been achieved.

export and locally sold on national basis for a period of 24 years i.e., from 1974-75 to 1993-94 are given in Table 1. The country has observed a phenomenal growth in processing of rice bran over the years. On the other hand, during 1974-75, the

country processed 160,000 metric tonnes of rice bran, which increased to 2788000 metric tonnes in 1993-94, almost 17.5 times increase over a period of 20 years. Obviously, this increase is not attributable to increase in paddy production alone, but the quality of rice bran has also considerably improved. A major factor in the changing scenario has been the introduction of modern rice milling system. It is well established that the rice bran produced by modern rice mills is much superior to the huller bran in the sense that the mill bran is almost free from the husk. Moreover, since, the modern rice mills are of much larger capacity, the collection of bran is much easier compared to collection from huller units due to their scattering, particularly in the rural areas. In spite of the increase in the availability of rice bran to the solvent extraction units, the full potential of rice oil, estimated at 80000 tonnes, has not been achieved. At present, the country is solvent extracting only less than 60% of the

Status of Rice Bran Oil In India

RICE BRAN PROCESSING, PRODUCTION & EXPORT (M.T.) DURING THE YEARS 1970-94

Period	Processed	Edible	Industrial	Total	Extraction	Export	Locally Sold
1970-71	170000	Nil	21000	21000	149000	130000	19000
1971-72	220000	Nil	30000	30000	187000	147000	40000
1972-73	185000	Nil	25000	25000	158000	118000	40000
1973-74	165000	Nil	24000	24000	140000	106000	34000
1974-75	160000	Nil	23000	23000	137000	102000	35000
1975-76	265000	Nil	36000	36000	230000	203000	35000
1976-77	540000	Nil	70000	70000	465000	402000	63000
1977-78	566000	Nil	80000	80000	481000	309000	101000
1978-79	680000	2500	98500	101000	574000	448000	110000
1979-80	786500	2450	110400	112850	666000	528700	125000
1980-81	922000	4000	126000	130000	780000	513300	265000
1981-82	1060000	10000	140000	150000	900000	579200	320000
1982-83	1090000	26500	126000	152500	922000	496500	390000
1983-84	1300000	23000	160000	183000	1095000	520500	575000
1984-85	1410000	19200	181000	200200	1193000	512000	625000
1985-86	1472700	32850	185950	217900	1246350	297650	900000
1986-87	1728400	93350	159000	252350	1461000	389600	1050000
1987-88	1940500	118650	159400	278050	1649800	352750	1297000
1988-89	2092250	124650	175500	300150	1774450	396450	1375000
1989-90	2340400	141125	208600	349725	1063500	634550	1325000
1990-91	2535000	162750	206800	369550	2146100	455650	1690000
1991-92	2553400	197700	168750	366450	2158700	519900	1638000
1992-93	2753404	206527	104622	301120	2325552	404454	1914000
1993-94	2788318	230917	176539	407456	2354550	497524	2130000
1994-95	2780677	245883	153420	399303	2361032	336079	2144000
1995-96	2973588	259938	168402	428340	2523658	302398	2295000
1996-97	2878977	265634	155456	421090	2443631	207708	2115000

potential rice bran oil. It may be possible that a fraction of the bran produced in the modern rice mills also does not reach the solvent extraction units due to a variety of reasons including sparse distribution of rice mills in some areas and associated difficulties in collection and transportation of this bran. A simple regression yielded the following model could reasonably describe the growth of rice bran processing capacity in the country.

$$Y = 142698.6 X - 49126.873$$

where, Y = quantity of rice bran processed, tonnes.

X = Time in years, since 1974-75 as base year.

The model had a correlation coefficient (R^2), of 0.988,1 which, indicates a good fit. The prediction errors in the model were generally less than 14% and exceeded 14% only at 2 points, indicating possibility of some unusual conditions in that year. The predicted and actual data are shown in Fig.1. Considering the form of the model, it is evident that the quantity of rice bran processed will continue to increase in future. This will be in the interest of the country to maintain the growing trend and efforts need to be made by all concerned including solvent extraction industry to accelerate this rate of growth. The approach in this direction could be to encourage establishment of more modern rice mills, so that large quantity of process grade rice bran can be produced and there should be a gradual phase out of the inefficient low capacity huller milling systems. The Government of India had initiated a scheme for the modernisation of huller mills in the country, which was partially successful. Clearly, mere increase in the number of rice mills will serve only part of the purpose because failure to modernise or phase out the huller

units will not increase the fraction of paddy available to rice mills and hence, reduce the milling season of rice mills, lowering the profit margin of the millers and not increasing the rice bran to the solvent extraction units. Therefore, it is necessary that all efforts are made to increase the production of paddy in the country. It should be possible, because the current production and productivity of paddy in the country are quite low compared to several other nations. (Sarkar 1993) The solvent extraction industry along with rice milling industry can play an important role

The Government of India had initiated a scheme for the modernisation of huller mills in the country, which was partially successful.

in this direction by initiating scheme for helping the farmer by providing necessary inputs for increasing productivity and assuring purchase at a reasonable price.

Total Oil

The production of rice bran oil (edible + industrial) increased from 23000 tonnes in 1974-75 to 407456 tonnes in 1993-94 almost by 18 times nearly the same as that rice bran processed (Fig. 2) The recovery level of oil from the bran, 14-15% appears to be good enough as the oil content in the bran itself is about 15-16% and further enhancement of oil recovery appears to be difficult, unless newer technology like biotechnology is developed and adopted. This suggestion is made in the light of some positive results obtained through enzymatic treatment of rapeseed and soybean in which it is claimed that the oil recovery could be increased by 2-4% (Smith *et al.*,

1993) The mathematical analysis of total oil yield from rice bran suggests the following model:

$$Y = 20854.21 X - 10403$$

where,

Y = total oil produced

X = time, years since 1974-75

The model has a correlation coefficient of 0.98 (R_2), which is quite good and the associated predicted errors are less than 14% except for two years (74-75 and 76-77) in which errors were larger than 14%. Interestingly, the two years for which the larger errors have been observed, are the same as in case of modelling of rice bran processed, confirming that these years were not normal. The trend of the model predicts higher availability of total rice bran oil in the future subject to the scenario discussed above.

Edible Oil

The objective of any industry is to produce a quality product, which can fetch higher market price. From this consideration, it is obvious that the quantity of edible oil produced by the industry is a measure of the performance of the industry. The country could not produce any edible oil from rice bran upto 1978-79 and the entire production of rice bran oil was of non-edible grade, which could only be used for the manufacture of soap, paints and other similar non-edible items. For production of edible grade oil, it is required that the bran may be processed quickly before free fatty acid (FFA) exceeds the permissible limits.

The country noticed a breakthrough in rice bran processing in 1978-79, when 2500 tonnes of edible grade oil, although meagre in quantity was produced for the first time. Since then, the production of edible grade oil has considerably increased almost by 100 times

Status of Rice Bran Oil In India

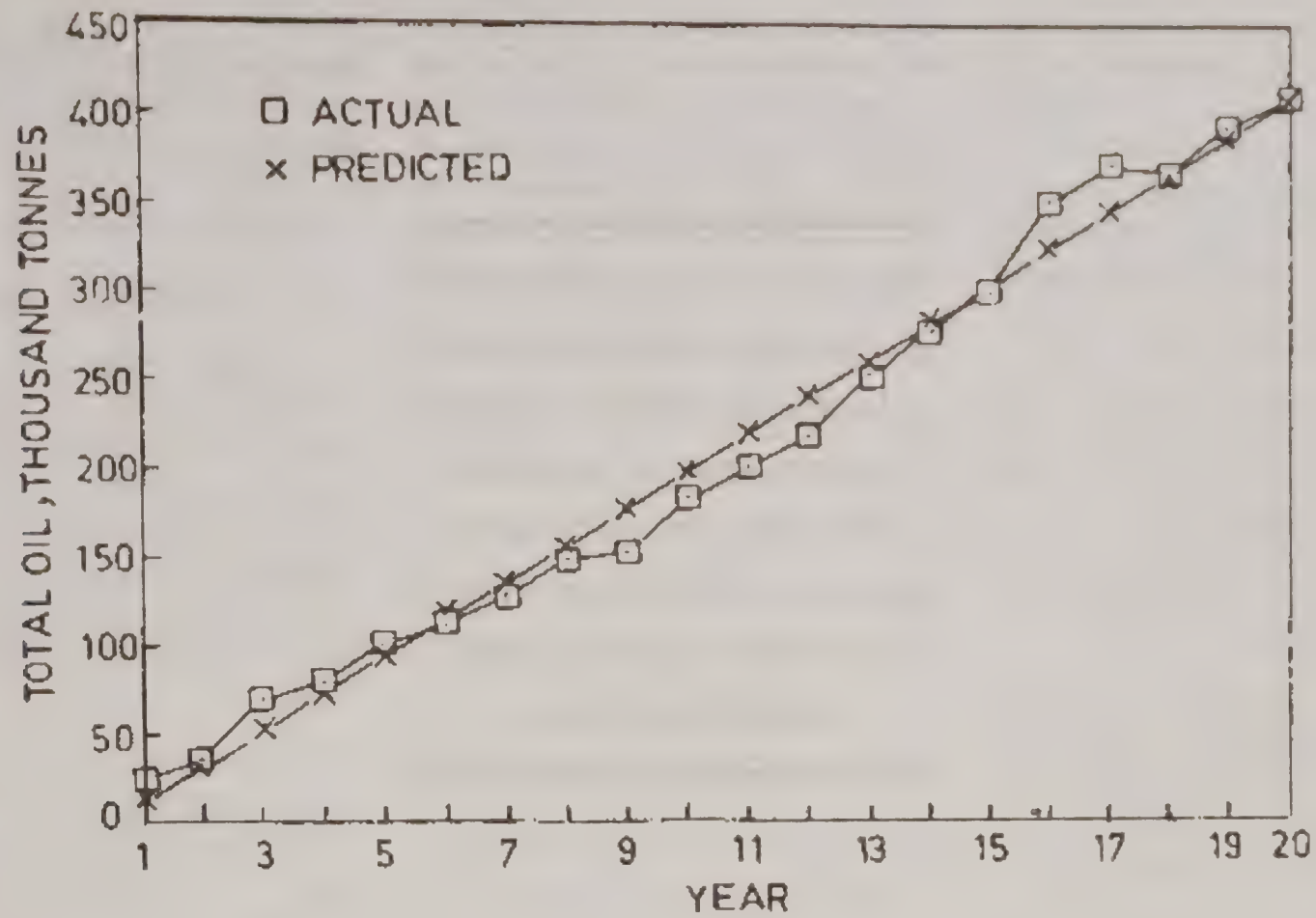


Fig.2. Production of Total Oil during 1974-1994

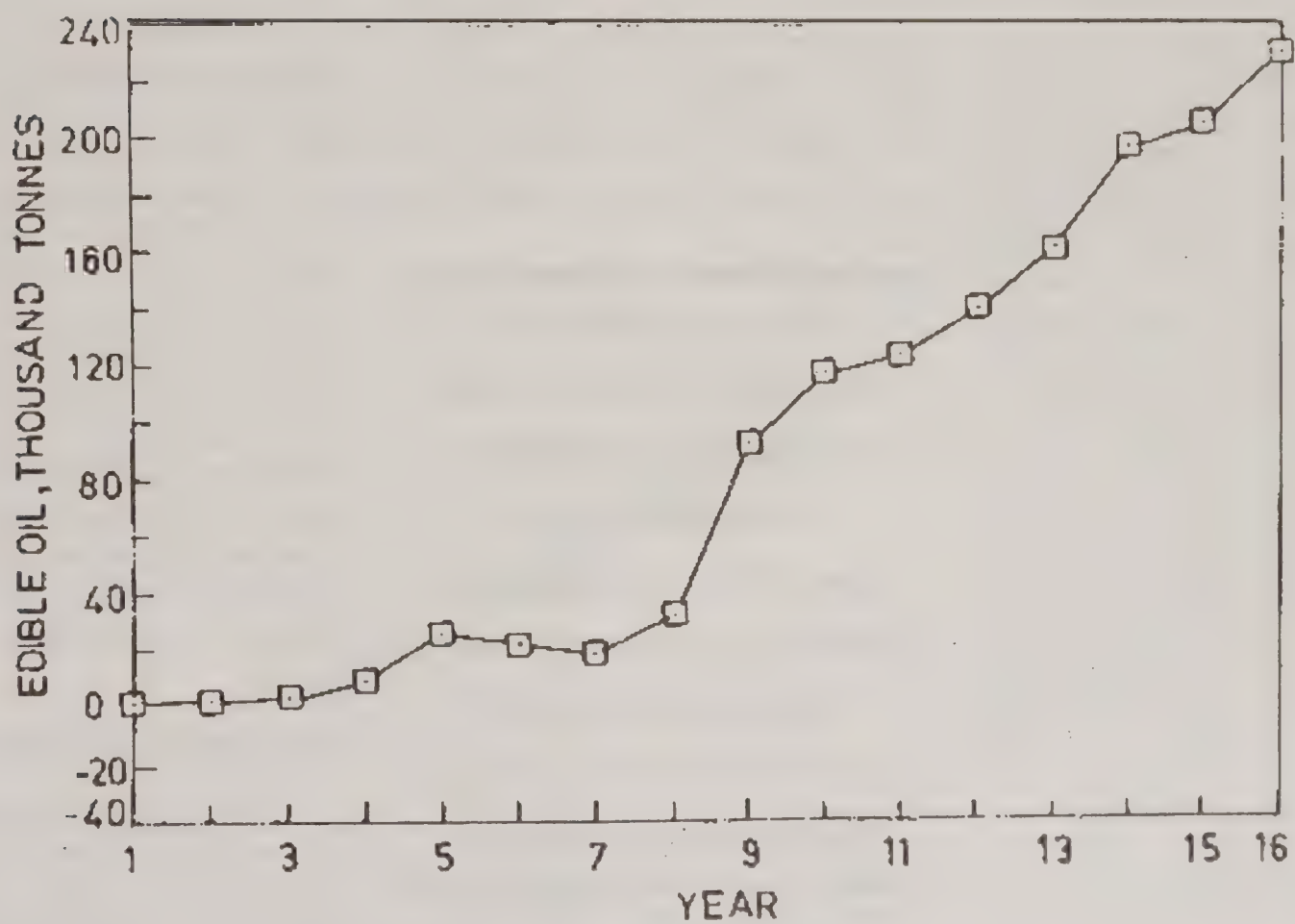


Fig.2. Production of Edible Oil during 1974-1994

during a period of 15 years. This is a good national achievement. In the year 1993-94, the portion of edible grade oil was 60%. To further increase this proportion, efforts need to be strengthened to develop a suitable rice bran stabilizer. However, the research experience of the country over the past 20 years has indicated that this is not a simple task as the economics does not favour a sophisticated rice bran stabilizer and a simple low cost stabilizer system may not be effective. Therefore, unless a breakthrough is made, this approach can not be counted upon.

A better strategy seems to be that a quick collection system for rice bran is developed such that the rice bran is processed within 8-12 hours of its production so that edible grade oil can be produced. This is achievable and is being adopted in certain areas of the country.

However, to take the full advantage of the technique, rice millers and solvent extraction people will have to work in harmony and devise a scheme in cooperation, to ensure that rice bran reaches solvent extraction plants well within time. Moreover, policy makers can also contribute significantly by ensuring that the scattering of location of rice mills is minimized as much as possible, by inspiring the millers to establish their mills preferably in or near the clusters close to the proximity of solvent extraction plants as far as possible. Mathematical analysis of the model for production of edible grade rice bran oil did not yield any simple model due to large deviations from the trends during 1982-83 to 1986-87. (Fig. 3)

Industrial Grade Oil

The industrial grade oil has generally increased over the years. However, the increase in the production of industrial oil has been only 10 times as compared to the

increase of 100 times of edible grade oil. In fact, during the last 5 years, the net production of industrial oil has declined from 208600 tonnes to 176359 tonnes, as proportion of edible grade oil has increased. In

The rice bran processed in the solvent extraction plants should be equal to the sum of deoiled cake and oil produced and any deviation from the balance indicates handling losses.

view of this trend for the last five years, it can be seen that the net availability of industrial oil will decline in future and the best scenario would be that it reaches zero i.e., the entire production of rice bran oil becomes edible oil. A regression analysis of industrial grade oil production did not yield any specific model as expressed, since it is related to production of edible grade oil also. The trend of the production of industrial grade oil indicated a wide fluctuation (Fig. 4)

The scenario can improve further if the producers, extractors, scientists, and government agencies come together and work in harmony in the interest of enhancing edible oil production.

Deoiled Cake

The deoiled cake is the residue of rice bran after extraction of oil. Evidently, the quantity of cake obtained depends on the quantity

of the bran processed. Since the quantity of rice bran has progressively increased during the last 20 years, the production of deoiled cake has also increased. The regression model for this commodity was as follows.

$$Y = 120326.9X - 37282$$

where Y is deoiled cake produced and X is time, in years since 1974-75. The correlation coefficient of the model (R^2) is 0.98. The associated errors were generally less than 20% for 18 years as in case of other regressions and errors were larger for only two years out of 20 years.

Deoiled bran is an important commodity and is currently used for poultry feed and other animal feeds. A considerable amount of deoiled cake is being exported to several countries. Export of the commodity has increased from 102000 tonnes in 1974-75 to 497524 tonnes in 1993-94, representing a 5-fold increase in 20 years. The export of any material is governed by international and domestic markets. The exports of this commodity have also considerably fluctuated during 20 years period. The export attained a peak of 634550 tonnes in the year 1989-90 and decreased to 404454 in 1992-93. The percent of export on the basis of total production of deoiled cake ranged from 17% to 87%. The locally sold rice bran is the difference of total production of deoiled cake and exports, obviously as the exports increase the material available for domestic market in terms of percentage decrease (Fig. 5)

Material Balance

The material balance of the solvent extraction industry was carried out to estimate handling losses, if any. The material balance could be written as :

$$RBL = RBP (DOC + TOY)$$

where RBL = Loss of rice bran

Status of Rice Bran Oil In India

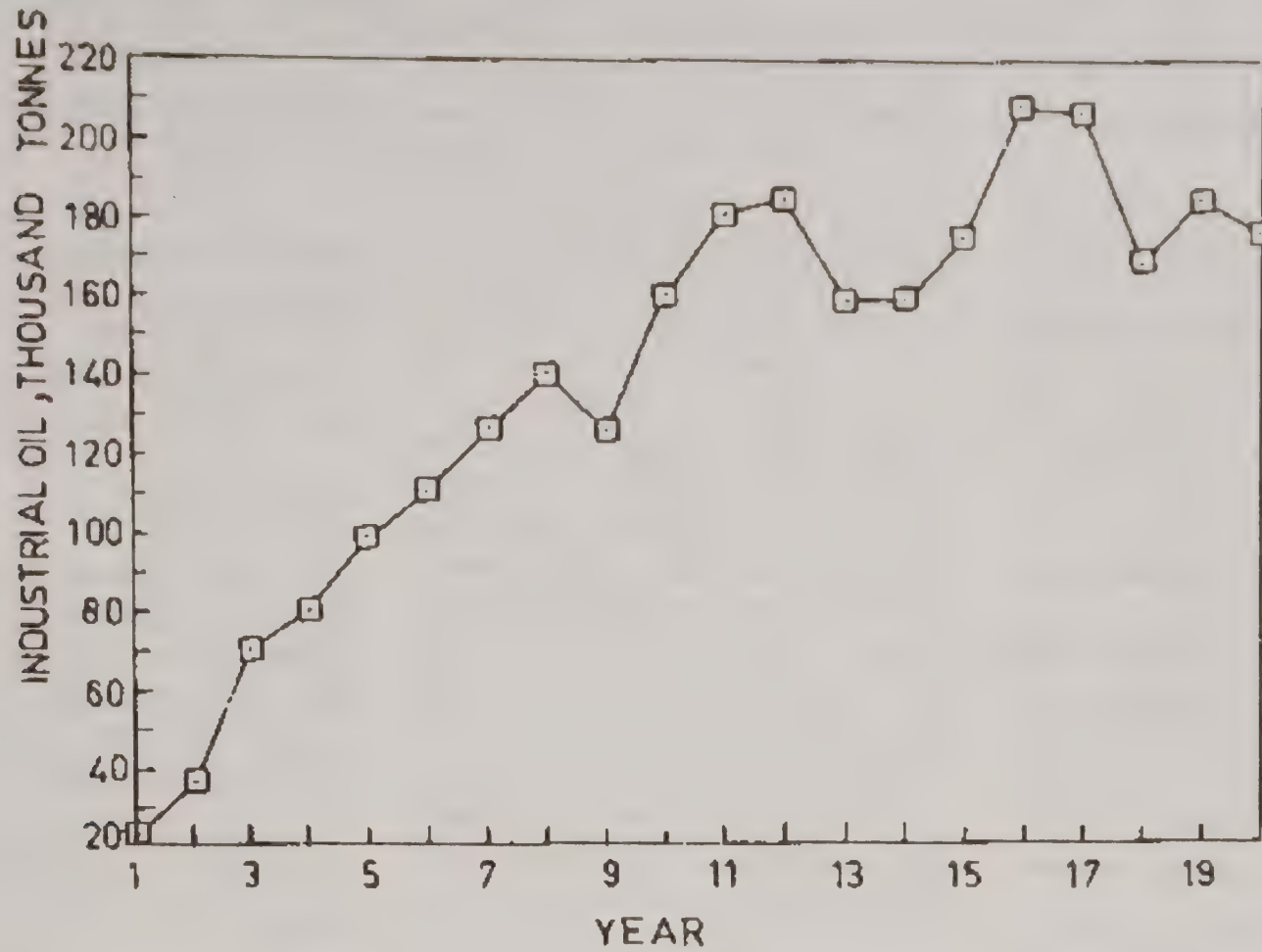


Fig.4 Production of Industrial Oil during 1974-1994

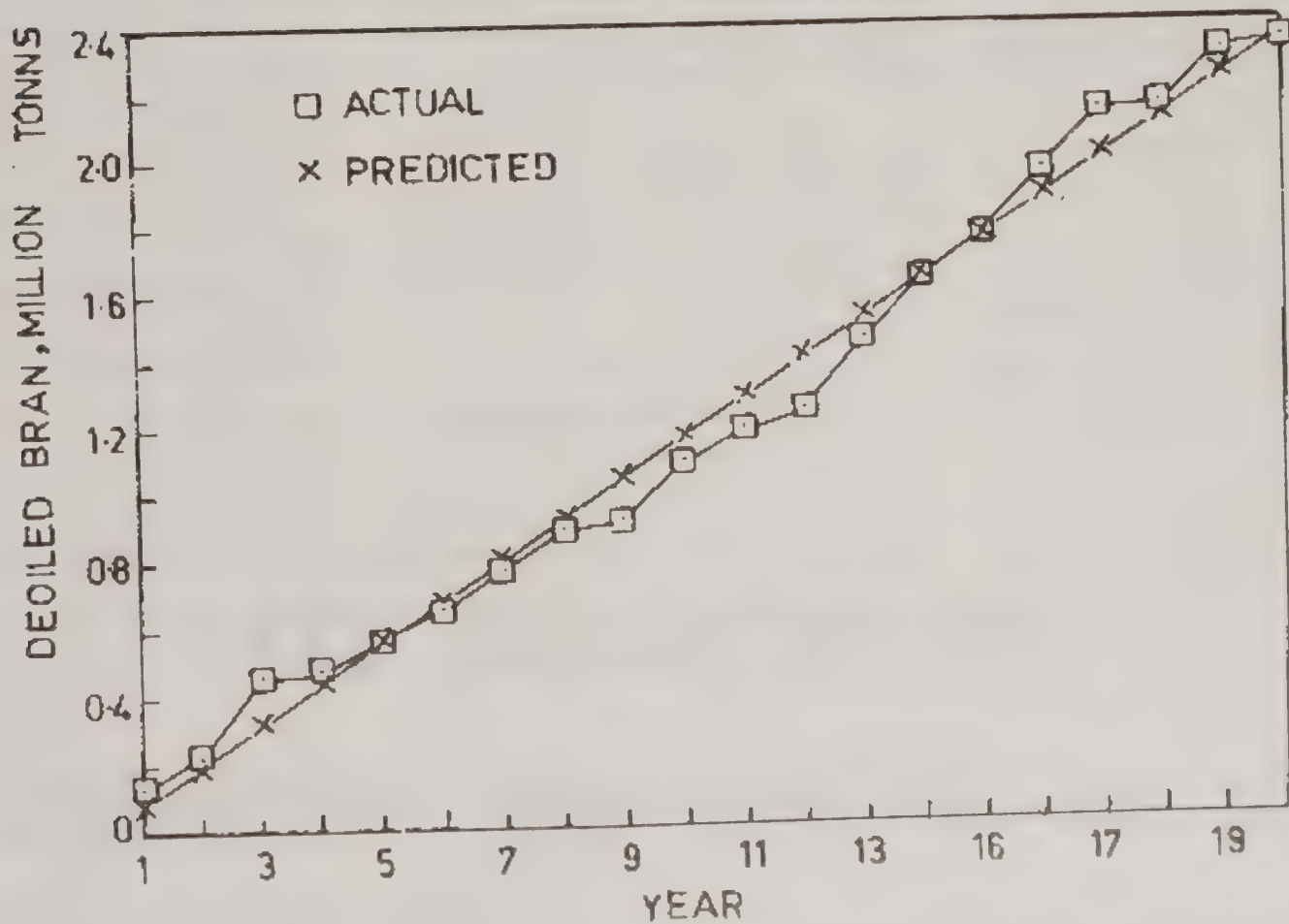


Fig. 5 Production of Deoiled Bran during 1974-1994

RBP = Rice bran processed

DOC = Deoiled cake, obtained

TOY = Total oil yield

The rice bran processed in the solvent extraction plants should be equal to the sum of deoiled cake and oil produced and any deviation from the balance indicates handling losses. The losses could result from a variety of factors including spillage, pilferation or non-accountability of oil or bran, during or after extraction. The analysis of the data for the last 20 years indicated a total loss ranging from zero (0) to 36713 tonnes. The handling loss in terms of percentage of input bran ranged from 0% to 1.69%. Similarly the loss of deoiled cake was also computed as follows:

$$\text{DOCL} = \text{DOC} - (\text{DOLE} + \text{DOCLS})$$

where

DOCL = Loss of deoiled cake

DOCE = Quantity of deoiled cake exported

DOCLS = Quantity of deoiled cake locally sold

DOC = Total quantity of deoiled cake

The total exported and locally sold cake should be equal to the production of deoiled cake. However, the material balance indicated this to be true only for 2 out of 20 years. In other years, the difference

varied from 50 to 272974 tonnes. In fact, this difference can not be considered as loss, since, there is a possibility that some of the cake may not have entered the market channels and could have been retained by the processors either due to the lack of demand or other compulsions. In terms of percentage, the unaccounted cake varied from 0.003% to 14.76% being comparatively larger than the handling loss or the loss input bran. Therefore, it appears that the market demand for deoiled cake is not stable and fluctuates from year to year.

Conclusion

On the basis of the analysis of the scenario, the following conclusions could be made:

The quantity of rice bran processed by the industry is continuously increased, almost linearly with respect to time, during the last 20 years. The quantity of rice bran has increased from 160000 tonnes in 1974-75 to 2788000 tonnes in 1993-94 almost 17 times.

The solvent extraction industry is producing edible grade oil since 1978-79. The quantity has since increased to 100 - folds during a period of 15 years.

The export of deoiled cake is governed by a number of factors including international scenario

and fluctuates considerably.

4. The scenario of rice bran oil can be mathematically modelled through regression analysis.

5. The scenario can improve further, if the producers, extractors, scientists, and government agencies come together and work in harmony in the interest of enhancing edible oil production.

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Studies On Various Quality Parameters For Grading Of Jaggery

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Introduction

Presently, there is no recommended grading criterion in force, which could be used to classify the quality of jaggery in the market. Sometimes, liquified jaggery of obnoxious and unpleasant odour/smell is consumed by economically poor people, as there are no standards to classify good and poor quality jaggery. Quality parameters of jaggery in terms of its colour, texture (hardness) and taste (flavour) varies from place to place and its end use as to whether to be used for table or cooking purpose. For instance, some people prefer to have jaggery with light golden yellow colour and medium soft texture and sweet in taste, while others prefer to have brown or brownish yellow colour with crystalline texture, which is very natural. Today, there is a separate class of consumers, who prefer this type of jaggery. Keeping in view, the present need of hour in respect of quality of jaggery and the data generated by various organisations in this regard, an attempt has been made to compile the data on quality standards, which could be used by the National/State level food standardisation organisations like Bureau of Indian Standards (BIS) and Prevention of Food Adulteration (PFA).

Materials and Methods

Data generated on jaggery analysis at Regional Sugarcane and Jaggery Research Station, Kolhapur

and Central Sugarcane Research Station, Padgaon and the present physical grading of jaggery followed by the Agricultural Produce Marketing Committee, (APMC) Kolhapur in terms of colour, texture and taste were used in the present study. Grading systems preferred and followed in Jaggery producing states like Uttar Pradesh, Andhra Pradesh and Punjab besides the standards adopted by BIS and PFA in this regard were also considered for this study. Standard AOAC methods were followed for chemical analysis of jaggery to estimate sugars, moisture, PH, extraneous matter, etc.

Norms/Criteria Fixed for Jaggery Grading

A meeting convened by the Mahatma Phule Krishi Vidhyapeet, Rahuri at Kolhapur under the Chairmanship of the Director of Research from the University discussed the various quality norms/ criteria and decided the norms for grading of jaggery after long deliberations. The meeting attended by the concerned faculties from the University (Chemistry, Agronomy and Soil Science) besides the officials from the office of Assistant Commissioner, Food and Drug Administration Department, Kolhapur, Government of Maharashtra and also APMC, Kolhapur and Satara who are leaders in the state of marketing of jaggery, recommended that the following important parameters of jaggery quality should be consi-

dered for fixing norms for jaggery grading. The norms are given below, while numerical values for each category are given in Table 1.

Physical Parameters

Colour

Light brownish colour is generally preferred by the consumers when compared to dark brown colour. Caramelization during gur making increases the dark brown shed of gur and this leads to poor quality of jaggery in terms of colour. At present, sodium hydrosulphate (Na_2HSO_3), a trade mark name used as 'Hydros Powder' is used to obtain bright yellow jaggery, far away from natural light brown colour. Such colour is beyond the permissible level of SO_2 in jaggery as per PFA (70 ppm and BIS (50 ppm). The maximum value of SO_2 in such jaggery samples in the market is reported to be in the range of 450 to 500 ppm. Further, consumption of such jaggery samples by the populations is not safe because of carcinogenic effect of the chemical on human health. Hence, while grading jaggery, the natural colour i.e., light brownish/yellow should over rule the other colours.

Texture and Hardness

Texture and hardness of jaggery are inter-related. Soft jaggery would have always soft tex-

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Table 1. Grading of Jaggery in Various Categories Based on Physical and Chemical Parameters

Grade	Special	'A'	'B'
PHYSICAL PARAMETERS			
Colour	Light brownish yellow	Medium brownish	Brown
Texture	Granular	Semi granular	Very small granular
Hardness	Hard	Soft	Very soft
Taste	Sweet	Sweet	Sweet
CHEMICAL PARAMETERS			
Non-reducing sugars (%)	80	75.1 - 80.0	70.1 - 75.0
Reducing sugars (%)	10	10.1 - 15.0	15.1 - 20.0
Moisture (%)	Up to 6	6.1 - 8.0	8.1 - 10.0
Extraneous matter (%)	Up to 1	1.1 - 2.0	1.1 - 2.0

Note: All groups should also abide the following parameters:

1. Sulphur dioxide (SO₂) content should be less than 70 ppm
2. Total sugars should not be less than 90%; Sucrose expressed as invert sugar not less than 60%
3. Total ash should not be more than 6%
4. Ash insoluble in hydrochloric acid (HCl) should not be more than 0.5%
5. Artificial colour and sweeteners are not permissible

ture and *vice-versa*. Granular texture is preferred for table purpose, while amorphous texture for cooking or making sweetmeat products. Both crystal size and crystal content are also taken in to consideration, while deciding the texture of jaggery. Crystal size and crystal content could be judged by rubbing some gur in between the tips of two fingers. Hard jaggery, which is having less moisture content is always good for transportation and have longer shelf life. Hardness of jaggery is found out by pressing nail thumb finger or by making scratch. Presently, hardness measuring devices are also available in the market under the name "hardness meter".

Taste (Flavour/Aroma)

The jaggery is sweeter in taste than sugar due to the presence of levulose (fructose) and dextrose besides sucrose. The taste is also influenced by the presence of other, foreign ingredients like mineral salts and dirt. This taste is always determined by putting the jaggery to the taste of experienced judges in this field.

Chemical Parameters

Sucrose

Sucrose plays an important role and due to higher percentage of it, jaggery fetches higher price both

by consumers and refiners. The jaggery with higher percentage of sucrose keeps better in storage, while low in sucrose is poor in storage and thereby fetches low market value.

Reducing Sugars

Dextrose (glucose) and Levulose (fructose) are reducing sugars. Although these are sweet in taste, their higher content in jaggery is always discounted because of their hygroscopic property, which affects the keeping quality adversely. The jaggery with higher percentage of reducing sugars is not accepted by refiners, as it reduces the recovery of sucrose.

Moisture

More percentage of moisture (more than 10%) adversely affects the keeping quality of jaggery. The jaggery having moisture per cent less than 6 has been categorised as superior.

Extraneous Matter

Begasillo and earth mainly constitute insolubles and dirt. The presence of these affects the quality of jaggery adversely. The jaggery

having less than 1 per cent dirt and insolubles is called as a superior quality jaggery.

On the basis of above norms, jaggery produced in Maha-rashtra has been categorised in special, A and B Grades (Table 1).

Recommendation

Data on different physical and chemical parameters generated and various criteria presently used in major markets in Maharashtra and

other States in the country were used for jaggery grading.

According, jaggery has been categorised into three grades as (1) Special, (2) 'A' Grade and (3) 'B' Grade.

Jaggery grading criteria could be useful in quality control and price fixation not only in Maharashtra but also in other States of the country. These could be used for export market, as there are no standards for this purpose.

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Advances in the Improvement of Raisin Quality

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Introduction

The word 'raisin' comes from the French word 'raisin sec' meaning dry grape. But in practice, raisin refers to only 'seedless dry grape' and it is the second most important product of grape vine. In India, though grapes are primarily used for fresh consumption in recent years, production of wine and raisins are becoming popular (Chadha, 1992). India is producing 12000 tonnes of raisin annually (Chadha, 1995) by making use of 40% seedless grapes produced in the country (Arve, 1992). India has been importing raisins from Afghanistan, Iran and Australia and is expected to become self sufficient in the next 3-5 years (Chadha, 1995). Raisins are extensively used in India in the preparation of various sweets and bakery products, whereas lexiors (dry seeded grapes) are used in the ayurvedic medicines.

Quality of Raisins

Indian market has been getting raisins for the past several years from Afghanistan. The types of raisins that are produced by natural shade drying ('Kishmish' variety) are small, round, plumpy and very sweet, light brown in colour with a coat of natural bloom (Giridhar and Satyanarayana, 1992). The green coloured raisins fetch premium price in the market under Indian conditions and with the type of raw material available, it is difficult to produce raisins that

are similar to those of Afghanistan (Giridhar and Satyanarayana, 1992). However, the Indian market does accept the raisins, which are yellow in colour, sweet and plumpy.

Raisins are extensively used in India in the preparation of various sweets and bakery products.

Factors Influencing Quality of Raisins

The final quality of raisins depends primarily on

- i) Raw material used
- ii) Pre-treatments given prior to drying
- iii) Drying methods adopted and
- iv) Package and storage conditions used when stored for longer period.

Flow diagram for raisin making is depicted in Fig 1.

Raw Materials

Quality of raisins is determined to a greater extent by the raw material or the variety used, its composition and maturity or stage of harvest since grape is a non-climacteric fruit. Therefore, apart

from seedless, the variety should have

- very high TSS, preferably greater than 20-22°Brix
- moderate to low acidity
- thin skin
- crispy pulp
- small sized, round to oval-shaped berries.

The raisins of international trade are mainly from three varieties, viz., 'Thompson seedless', 'Black corinth' and 'Muscat of Alexandria' (Winkler *et al.*, 1974). Amba Dan *et al.* (1987) evaluated 'Pusa seedless', 'Perlette', 'Delight', 'Sultanine-II', 'Thompson seedless', 'Sundekhiani' (grapes imported from Afghanistan) for raisin making by comparing them with the market samples. The prepared bunches were dipped in 0.5% boiling sodium hydroxide solution for 5 sec., sulphured to 10 g/kg of grapes for 3 hours and dried in a kilburn drier initially at 65-70°C, followed by 50-55°C. Based on the organoleptic evaluation, raisins prepared from 'Sundekhiani' grapes were judged as best followed by imported market samples. 'Thompson seedless' was reported to make good raisins, whereas 'Perlette' was unsuitable (Kaur and Bindne, 1985). 'Arkavati' a seedless grape hybrid developed at the Indian Institute of Horticultural Research, Bangalore is reported to produce raisins better than that of 'Thompson seedless' (Amba Dan *et al.* 1987). The desir-

able characters of 'Arkavati' are 2-3 higher TSS, leading to higher raisin yield, thin skin leading to soft texture and quicker drying, small sized round to oval shape, since it does not respond to gibberillic acid treatment unlike other seedless varieties. Christen and Mary (1994) compared three clones of 'Thompson seedless' and found the clone '1A' produced higher raisin yield than 'Urla-HT' or 'Enns-HT' which was attributed to heavier berries and clusters of '1A'. Seven yellow coloured seedless grape hybrids developed at the Indian Institute of Horticultural Research, Bangalore were compared with 'Thompson seedless' and 'Arkavati' to test their suitability for raisin making (Doreyappa Gowda *et al.*, 1997). All the hybrids had thin skin except 'E-31/4' and 'Thompson seedless' varieties. The raisin yields were significantly higher than 'Thompson seedless' in 'E-29/5', 'E-31/5', 'E-12/7', 'E-12/3' and 'Arkavati'. Based on sensory evaluation, new hybrids 'E-29/5', 'E-12/3' and 'E-12/7' were considered to be superior to 'Thompson seedless' and were comparable to 'Arkavati' (Doreyappa Gowda *et al.*, 1997).

Delaying of harvesting of grapes, would give a balance in sugar and acid content in years, when the rates of accumulation of day degree are low. Delaying of harvest by 15 days may increase TSS content of berries by 1.73 to 2.05°B and reduce the acidity compared to the normal harvest. Therefore, it is desirable to schedule the harvesting 12-15 days later than normal, when the grapes are to be used for raisin making.

Pre-treatments

In several fruits, natural wax occurs on the surface, as a protective layer. The grape berries will have a wax of about 0.1 mg/cm², which is a mixture of long chain alcohols, esters of alcohols and fatty acids. The grape berry is natu-

rally very resistant to water loss, as it has a very hydrophobic bloom consisting of overlapping wax platelets. The cuticle and in particu-

The grape berry is naturally very resistant to water loss, as it has a very hydrophobic bloom consisting of overlapping wax platelets.

lar, the outer layer is the structure which limits the drying rate or loss of moisture during drying process of the grape berries. Chemical treatment of berries helps in breaking the wax barrier to increase the drying rate (Amba Dan, 1985).

Alkali Treatment

Dipping of prepared grape bunches in boiling sodium hydroxide (lye) apart from removing the waxy bloom on the surface of fruits will also form small cracks on the surface. Boiling sodium hydroxide (0.5 to 1.0%) for 3-5 seconds followed by rinsing has been tried as early as 1920. Singh *et al* (1974) evaluated various chemical treatments on the rate of drying and

Combination of 0.4% NaOH, sulphuring (2 g/kg) and dipping in oil (2-3 mm of groundnut oil) in water produced the best raisins.

recovery of raisins. Treatments of berries at 0.4% boiling sodium hydroxide gave quicker drying than 0.2%. Combination of 0.4% NaOH, sulphuring (2 g/kg) and dipping in

oil (2-3 mm of groundnut oil) in water produced the best raisins. Among the four different treatments tried for checking, five seconds dip in 0.5% boiling solution of caustic soda was found to be the most efficient and gave the raisins of the best organoleptic quality from 'Pusa seedless' grapes (Amba Dan *et al.*, 1987). Khedkar *et al.*, (1985) reported that pre-treatment by 0.3% lye dip for 60 seconds imparted uniform checking with minimum percentage of rupture. Lye treatment (0.2% NaOH) reduced the drying period in 'Thompson seedless' (Bhutani *et al.*, 1980). In a similar study, Kulkarni *et al.*, (1986) reported that 0.3% lye concentration and 60 seconds gave perfect and uniform checking in 'Thompson seedless' variety, whereas Thimma Reddy and Selvaraj (1988) observed that 0.5% boiling NaOH treatment for 5 seconds hastened the rate of drying in shade by six days and uptake of sulphur dioxide during fumigation was also highest in 'Thompson seedless'. However, the sensory quality of raisins was best without any dip treatments. According to Doreyappa Gowda (1992) 'Arkavati' grapes for raisin making were dipped in different concentrations of boiling sodium hydroxide solution for different durations, washed in cold water, fumigated (5 gm/kg for 24 h) and dried in hot air drier. Sodium hydroxide treatment consisting of 0.3% (boiling) for 3 seconds improved the colour of raisins by better infiltration of sulphur dioxide during fumigation due to checking, apart from reducing the drying time.

Dipping Oil Treatment

Many progressive grape growers are making raisins without sulphur fumigation by the use of dipping oil, which is imported from Australia. This oil has ethylene oleate as one of the constituents and while preparing the solution,

potassium carbonate has to be added to raise the pH of the solution to 10. In practice, 2% dipping oil combination with 2.5% potassium carbonate is recommended by the manufacturers. Removal of waxy bloom without cracking berry skin has been observed due to 2.5 lbs of potassium carbonate, 2 lbs sodium hydroxide and 0.87 litre of olive oil in 227 litres of water at 88°C (Amba Dan and Anand, 1972)

Use of olive oil in raisin making has been recommended as early as 1930. Drying to 18.0% moisture was found to be faster and just took half of the time due to surface modification by pre-treatments such as emulsion (dipping oil), caustic soda or thermal treatments (Aguilera *et al.*, 1987). Giridhar and Satynarayana (1992) have studied the effect of various pre-treatments, including dipping oil, with respect to drying rate and colour development during drying and storage. Lye and blanching treatments, gave good coloured raisins, but with stickiness and the product lacked body. The emulsion dip treatment combined with sulphur dioxide fumigation with an additional spray of emission after 30 per cent of drying gave good non-sticky end product with bright yellow colour having good body and texture. The work carried out at the Indian Institute of Horticultural Research revealed that the dipping oil treatment did not produce larger per cent of greenish tinged raisins, but resulted in brownish coloured, soft textured raisin. Combination of lye treatment followed by dipping oil treatment and sulphur fumigation was found to be desirable, since it produced very good, yellow coloured and soft textured raisins.

Sulphur Fumigation

Before drying of grapes, sulphur fumigation is done in order to prevent browning and also to give golden yellow colour and to protect the raisins during storage. Sulphur

dioxide is a selective antiseptic and temporary preservative, since it is easily oxidised as sulphate. More sulphur dioxide is required for preventing fermentation than to inhibit growth. To get high concentration of sulphur dioxide in short time, burning of sulphur in closed chamber is practised. In raisins, the use of sulphur dioxide is for multipurpose as follows:

- a) Improves attractiveness by preserving the yellow colour or by giving golden yellow colour by bleaching.
- b) Preserves flavour,

Before drying of grapes, sulphur fumigation is done in order to prevent browning and also to give golden yellow colour and to protect the raisins during storage.

- c) Protects the nutritive value,
- d) Prevents enzymatic actions,
- e) Reduces microbial deteriorations- due to increase in the thermal death rate and
- f) Repels insects to certain extent during drying as well as storage.

Amba Dan and Anand (1972) have recommended 10 gm of sulphur per kg of grapes for 2 h., whereas Singh and Dhawan (1973) have suggested that lye treated moist grape berries should be exposed to sulphur fumes at 3-4 gm for 2-4 hrs. Dhooria *et al.*, (1973) observed proper colour development in grapes due to dipping in 1% solution of potassium metabisulphite for 15-20 min. or fumigation in a sulphur chamber after alkali treatment. Better colour of raisins due to sulphitation with 1 per

cent potassium metabisulphite for 10 mins has been also reported (Kulkarni, 1986).

Doreyappa Gowda (1994) has studied the effect of dosage of sulphur (2-5 gm/kg) for 3 hrs.) on NEB, sulphur dioxide content and sensory quality of 'Arkavati' raisins. Lower NEB, better colour and overall acceptability scores and higher SO₂ content of raisins were observed at 5 gm of sulphur /kg of fresh grapes. But 3 gm/kg was found to be sufficient, when raisins were stored subsequently at low temperature (3-5°C) instead of ambient temperature.

Drying or Dehydration Methods

The common method used in raisin making was open sun-drying and shade-drying, solar-driers and tray-driers or commercial driers are also used in the drying of raisins. The drying is carried out, till a final moisture content of around 15 per cent is reached in raisins.

Sun-drying

It is a cheapest method, but it is somewhat slow and the product will develop deep brown colour and produce inferior quality raisin, since there is no control over temperature and relative humidity of drying atmosphere. Singleton *et al.*, (1985) have tried to find out the reasons for browning of sun-dried raisin to a greater extent. In the sun, caftaric acid (the major phenol of the pulp) rapidly disappeared. When grapes were allowed to dry in subdued light at room temperature, caftaric acid persisted with little change for some time and then disappeared suddenly leading to onset of browning. The authors believe that during raisining, caftaric acid and polyphenol oxidase are separately compartmentalised and browning is delayed until the separation is broken. The time taken for drying 'Arkavati' grapes was just one third of shade-drying under

Advances in the Improvement of Raisin Quality

north Karnataka conditions (Kattimani and Hulmani, 1985).

Shade-drying

Though, shade drying takes more time than other methods, the product attains very good colour. In Maharashtra, many growers are raising shaded structure, over a large area, with many layers of nets one above the other with sufficient gap for proper air circulation and for periodic turning of grapes. This is also a cheaper method and takes only 12-15 days, due to very high temperatures during the season at these areas. Highest overall acceptability scores of raisins of 'Arkavati' have been observed due to lye treatment followed by drying in shade (Doreyappa Gowda, 1994; Kattimani and Hulamani, 1995).

In California, the raisins from 'Thompson seedless' are dried in natural conditions without dip treatments and termed as naturals. The product will be dark greyish brown with natural bloom on the surface.

Drying in Electrical Driers

Though it is an expensive method due to higher cost of electricity involved, it takes very less time and quality will be also better. Amba Dan *et al* (1987) have studied the effect of drying temperatures on time and colour of 'Pusa seedless' raisins. The rate of drying was three times faster at 70-75°C than at 50-55°C, but drying at higher temperature led to the development of unattractive dark brown colour and suggested drying initially at 65-70°C, till the two third of their original weight and finally lowering the temperature to 50-55°C. The time required for drying was only 70 in oven, whereas it was 32 and 23 days in shade and sun-drying, respectively. Higher moisture content and sulphur dioxide, lower NEB were observed in shade-dried raisins leading to higher overall

acceptability scores (Thimma Reddy *et al.*, 1998).

Drying in Solar Driers

Singh and Bhawalkar (1985) fabricated a most simplified economically cheap drier in which drying period was reduced to 7-8 days from 17-20 days. The temperature in this dehydrator remained 10-15°C higher than the required maximum temperature of 60-70°C, which could be regulated by optimising surface to load ratio or by increasing air flow by mechanical means. The time taken for drying was only six days in solar dehydrator with air blower compared to 8 days in open sun (Khedkar *et al.*, 1985). Cabinet type

Storage at low temperature (4-5°C) is the best method to retain golden yellow colour as well as organoleptic quality.

solar drier and natural convention solar drier were compared with open sun-drying of grapes and it was observed that the time taken was less in the former but the quality was better in the latter (Godara and Chauhan, 1987). Though the rate of drying of grapes is faster in solar drier, the quality of the raisins will not be comparable either to shade or tray drier-dried raisins, due to a temperature higher than the optimum for drying and too much variations observed in the temperatures from morning to evening in the solar driers.

Post-drying Processes

The grapes dried to around 15 per cent moisture are separated from rachis, washed in luke warm water to remove dust, pesticide residues, excess of chemical, which may be present on the surface and allowed to dry in a well ventilated/

aerated place. Further, these raisins are put in a big air tight container and left for 3-4 weeks for what is known as curing or equalisation of moisture.

Depending upon the TSS of grapes used and final moisture content of raisins, 20-25% of yield is obtained. Higher the TSS, better will be the yield and quality of raisins.

Packaging and Storage of Raisins

The cured raisins are packed in 150-400 gauge polythene bags, placed in small corrugated boxes and stored. Sulphur dioxide is better retained in glass jars or alkalthane bags than in carboard or paper bags (Amba Dan *et al.*, 1987). Storage at low temperature (4-5°C) is the best method to retain golden yellow colour as well as organoleptic quality. (Amba Dan *et al.*, 1987) Roy *et al.*, (1992) have reported that zero energy cool chamber increased the shelf life of raisins upto 9 months. On an average, the cool chamber maintained 12-15°C lower temperature compared to the outside maximum with high relative humidity. At the end of 9 months storage, reduction in NEB and better sensory scores of raisins were observed in cool store (4 +1°C) followed by cool chamber (11.72-26.75°C), over a storage period of 11 months at room temperature (20-25°C) and low temperature (4 and 10°C). Substantial decrease in sulphur dioxide especially in samples stored at room temperature which had higher browning index has been reported (Cancellas *et al.*, 1993). Doreyappa Gowda (1994) found that storage at low temperature was advantageous since NEB, after a storage period of 6 months was lower due to better sulphur dioxide retention leading to higher overall acceptability scores due to better colour and flavour, though the texture was not influenced much.

Advances in the Improvement of Raisin Quality

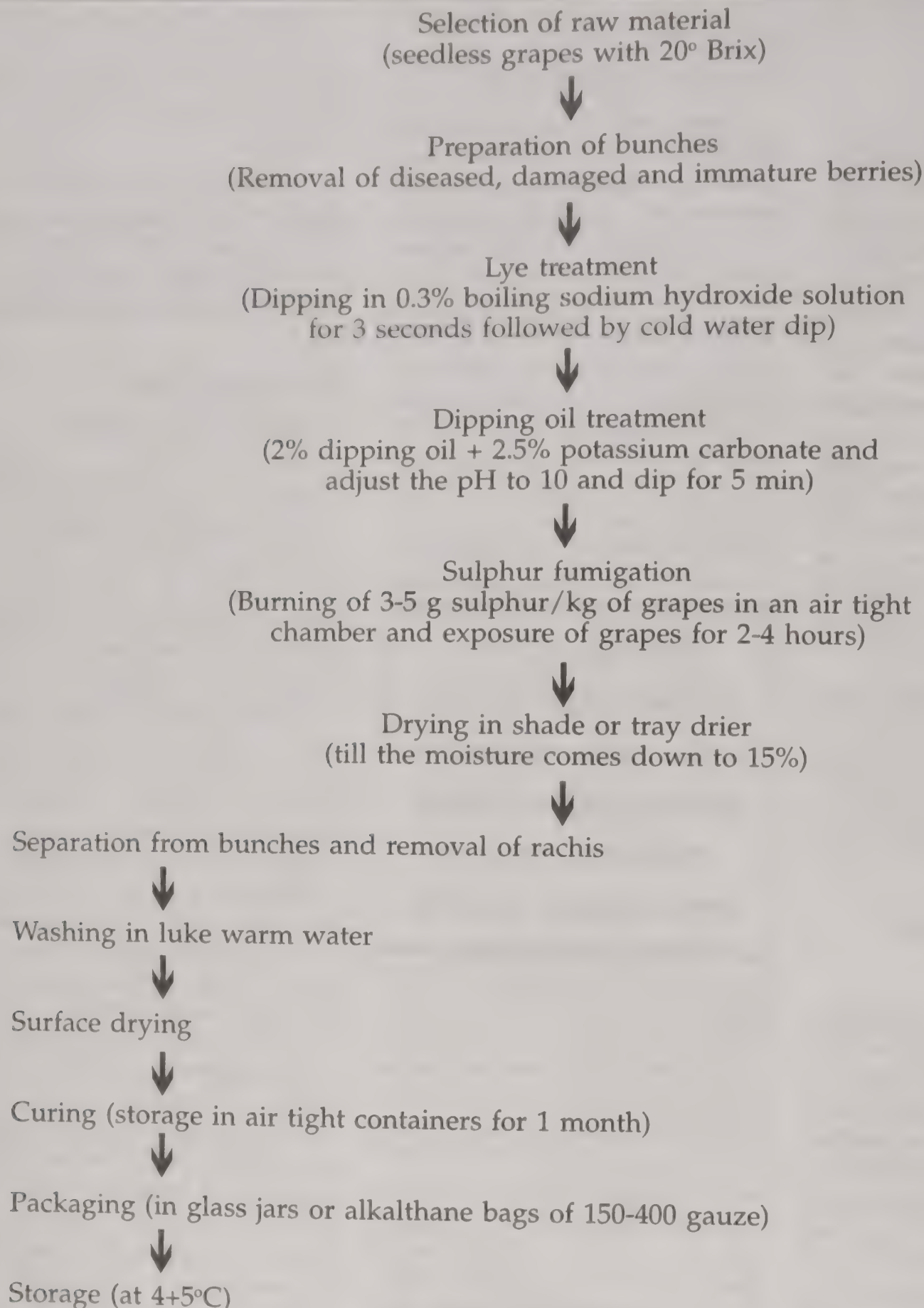


Fig 1. Flow diagram for raisin making

Conclusion

In the preparation of good quality raisins, not only the preparation techniques, but to start with ideal type of raw materials is a must. The 'Thompson seedless' which is grown all over the world can be used. The new hybrids of Indian Institute of Horticultural Research, Bangalore, 'Arkavati' and few other seems to be promising.

But, these have to be tried for cultivation on large scale at major grape growing regions. The lye treatments (0.3% boiling sodium hydroxide dipping for 3 sec.) followed by sulphuring at 3-5 g per kg of fresh grapes for 2-4 hours and subsequently drying in electrical tray driers or shade produces better quality raisins. Though shade-drying takes more time than drier, it is cheaper and gives attractive

golden yellow colour, if sulphured prior to drying. During recent years, the progressive grape growers of Maharashtra are going for dipping oil treatment in place of sulphuring since the dipping oil treatment, which is a cold treatment is easier to practise and yield greenish tinged raisin. Efforts are needed to get higher percent of greenish tinge to raisins. Since a considerable amount of raisins tend

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to become brown or brownish green during preparation and storage. Development and production of a good quality dipping oil on commercial scale is of immediate need, since the dipping oil imported presently from Australia will be expensive, once the Government subsidy is removed. By producing large quantities of good quality raisins, India will not only become self-sufficient, but also explore the possibility of exporting to other countries.

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Soybean Lecithin - Its Manufacture, Properties and Applications

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Introduction

A Frenchman named Maurice Goble observed phosphatides and isolated them for the first time in egg yolk in 1846. He named it *lekithos*, which is Greek for yolk of an egg and twenty years later, the choline component in lecithin was identified. Lecithin was characterized in pure form by precipitation of the cadmium chloride salt from alcohol solution. Egg lecithins contain small amounts of other phosphatides and minor constituents.

Definition

Lecithin is a mixture of polar and neutral lipids with a polar-lipid content (insoluble in acetone) of atleast 60%. This definition corresponds to the standardized European community description of lecithins for the food sector.

Before we go further into the topic, a list of abbreviations is given below for reference.

Lecithin is a mixture of polar and neutral lipids with a polar-lipid content (insoluble in acetone) of atleast 60%.

Phosphatides	PHT
Soybean	SB
Soybean oil	SBO
Phosphatidylcholine	PC
Phosphatidylethanolamine	PE
Phosphatidylinositol	PI
Phosphatidylserine	PS

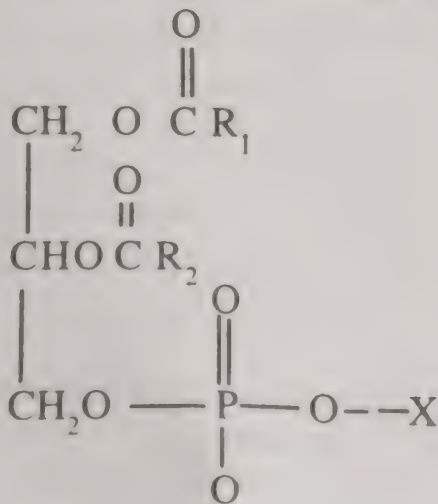
Commercial lecithin which, according to the *Food Chemicals Codex*, may contain up to about 50% neutral oil. Lecithin can be obtained from vegetable oils (e.g., SB, corn, rapeseed, peanut, sunflower, and safflower). The PHTs present in lecithin from different sources are similar but are in different proportions, thus giving lecithins different properties.

Typical Composition of Soybean

Moisture	11%
Proteins	42%
Carbohydrates	26%
Fat	19%
Phospholipids	2%

Source: Lucas Meyer (1990).

Table 1. Structural Formulas



If, we replace "X" by	then we get
- CH ₂ CH ₂ N ⁺ (CH ₃) ₃	PC
- CH ₂ CH ₂ NH ₃ ⁺	PE
- Ph (OH) ₅	PI
- CH ₂ CH(NH ₃ ⁺)COO ⁻	PS
- H	PA

R₁ and R₂ = C₁₅ - C₁₇ hydrocarbon chains

* KANCOR IS THE EXCLUSIVE AGENT IN INDIA OF LUCAS MEYER GMB, HAMBURG, GERMANY.

Soybean Lecithin - Its Manufacture, Properties and Applications

Structural Formulas (Table 1)

Pictorially, phospholipids can be shown to have two ends, one the hydrophilic end which is shown as a head-like structure and the other, the lipophilic end shown as the tail-like structure (composing of the group - X). Orientation of this structure at the interphase of the two immiscible phases helps reduce surface tension. Thus, PHTs act as emulsifiers too.

Commercially, lecithin is derived from soybean because of the relatively large amount of lecithin in crude soybean oil i.e., usually 2.50% to 3.25% in terms of commercial lecithin and because of the enormous quantities of SB grown and processed. The material consists roughly of 64% mixed PHTs and 36% crude SBO. The term, lecithin, is used below only to denote PC, i.e., pure lecithin.

All commercial lecithin products are not the same but can vary according to their source, component phosphatides, other constituents and the processing to which they are subjected. Egg lecithin products have little commercial importance as they are used as

emulsifiers in the preparation of fat emulsions for intravenous alimentation. Even PC may vary in composition according to the degree of unsaturation, chain length and po-

All commercial lecithin products are not the same but can vary according to their source, component phosphatides, other constituents and the processing to which they are subjected.

sition of the fatty acids. Resulting differences in properties have distinct biological significance; e.g., a saturated lecithin, dipalmitoyl PC in lung tissue, is involved in oxygen uptake, whereas dilinoleyl PC is involved in lipoprotein formulation and in cholesterol mobilization.

Lecithin and PHTs are of universal occurrence in living organisms. They are constituents of biological membranes and are involved in permeability, oxidative phosphorylation, phagocytosis and

chemical and electrical excitation. Lecithin was identified in microorganisms and animal tissues and organs like the brain, nervous system, liver, heart, lungs, kidney, blood, milk, etc.

In animal and vegetable lecithins, both saturated and unsaturated fatty acids are present, but their proportions vary with respect to the source and composition of the triglycerides with which the lecithin is associated in nature. Generally, the extract of lecithin and associated PHTs is less unsaturated than the oil from which it is derived. Soybean oil has an iodine value of about 130, whereas the mixed soybean phosphatides, including the lecithin, have an iodine value of about 95. However, some SB PC fractions are isolated with 65% to 70% linoleic acid for pharmaceutical purposes. The location of the unsaturated fatty acid is mostly at the 2 beta-position of the glycerol moiety. Moreover, vegetable PHTs contain no sphingomyelin and animal PHTs contain no PI.

Typical fatty acid composition of commercial lecithins is given in Table 2.

Table - 2. Comparative Fatty Acid Profile (%) in Soybean Oil and Lecithin Products*

Number of carbons and double bonds	Soybean oil	Commercial lecithin	Oil-free commercial lecithin
Saturates			
C 16:0	9	15	19
C 18:0	5	5	5
Total	14	20	24
Unsaturates			
C 18:1	26	17	10
C 18:2	53	55	59
C 18:3	7	8	7
Total	86	80	76

* Source : Kirk Othmer (1981)

Commercial soybean lecithin and commercial vegetable lecithins from other sources, unlike animal lecithins contain high percentage of free and bound carbohydrates that essentially are plant sugars, i.e., dextrose, raffinose, galactose, and stachyose. Cholesterol is absent but substantial amounts of phytosterols and sterol glycosides are present. Unlike animal PHTs, SB PHTs do not contain cholesterol. However, like some of the animal PHTs, they contain D-galactose in various combinations and in the adsorbed state. Soybean PHTs can also be associated with compounds e.g., stigmasterol, dihydrositosterol, the sitosterols and compounds of inositol. Steps involved in the production of PC, PE and PI are depicted in Fig 1.

PHTs exhibit stereoisomerism, especially the phosphoinositides, in which all six carbon atoms of inositol are asymmetric. PHTs also exhibit zwitterionic form.

Whereas animal PHTs are likely to be in labile combination with proteins, e.g., the so-called lecithoprotein or vitellin of egg

yolk. Vegetable PHTs more generally are in less labile combination with carbohydrates e.g., dextrose, D-galactose, and even pentoses. Thus, in the solvent extraction of SB with hexane, the free PHTs are readily extracted with the oil. Further extraction of the residue with a mixture of hot absolute alcohol and benzene disrupts some of the more labile carbohydrate combinations or dissolves them altogether, yielding another PHT fraction. After boiling, the extracted residue with dilute mineral acid and extracting with another solvent, e.g., trichloroethylene, still another fraction of PHTs can be obtained. As the concentration of the acid is increased and the period of boiling is lengthened, more PHT fractions can be extracted.

Physical Properties

Commercial lecithin is brown to light yellow in colour, depending on whether it is unbleached or bleached. Proper refining makes it free of odour and gives it a bland taste. The consistency may vary from plastic to fluid.

Solubility of Lecithin

(a) It is insoluble in water but is dispersible in water. (b) is soluble in aliphatic and aromatic hydrocarbons including halogenated hydrocarbons (c) is partially soluble in aliphatic alcohols (d) PC is soluble in ethanol (e) particle in water exhibits myelin growths, i.e., cylindrical sheets that are formed by bilayers and are separated by water and which may break up into liposomes (vesicles with a single bilayer of lipid enclosing an aqueous space). PHTs form multilamellar vesicles spontaneously. These could be converted to the thinner, bilayer structure by sonication. (f) is insoluble in polar solvents like ketones e.g., acetone. (g) is soluble in mineral oil and fatty acids. (h) is insoluble in cold vegetable and animal oils. (i) gets dispersed in hot vegetable and animal oils but separates on cooling if mineral oil, fatty acid or any other coupling agent is not added. (j) when melted and when a small percentage of water is dispersed into it, it forms an imbibition, and

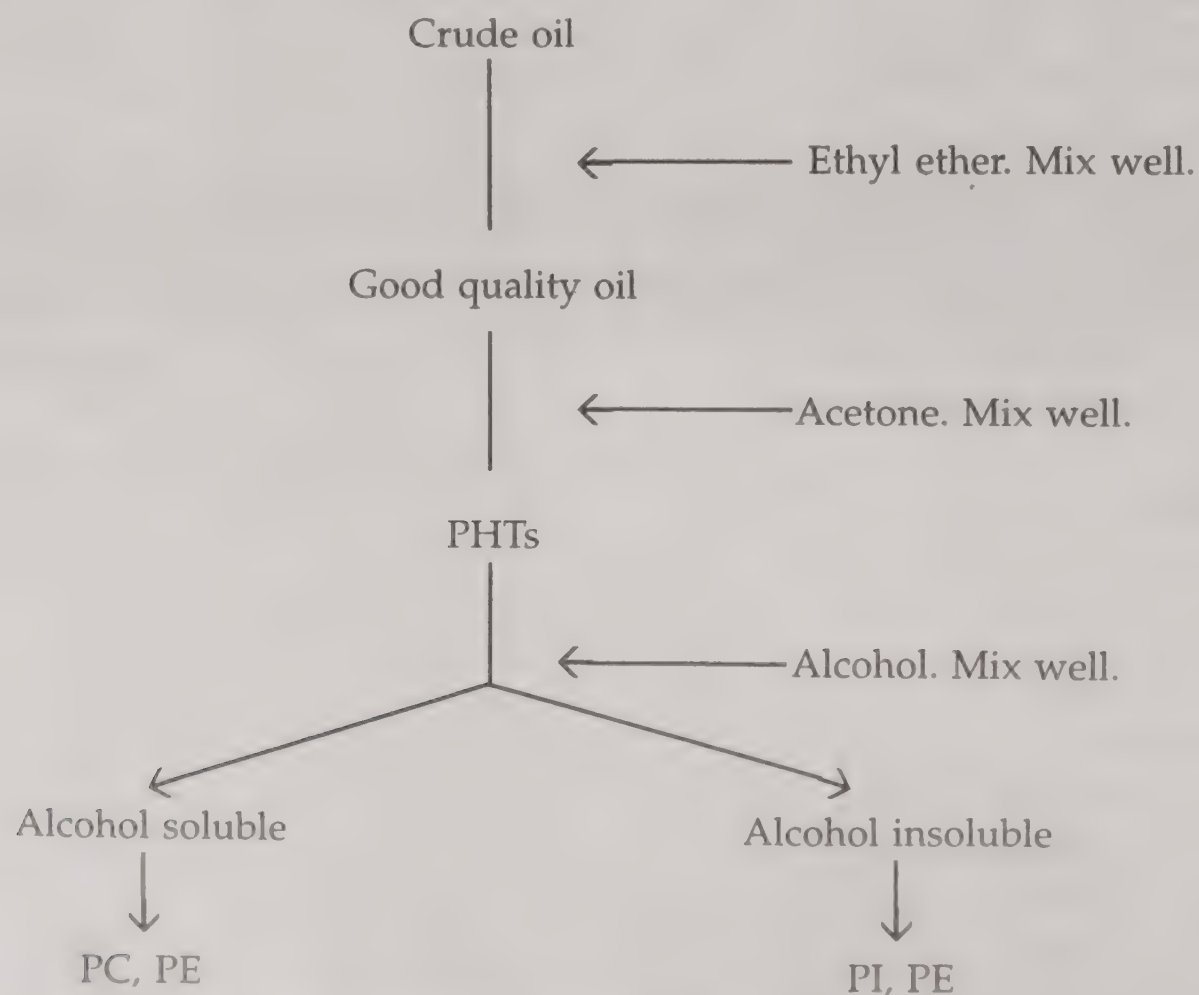


Fig 1. Steps involved in the production of PC, PE and PI

(k) forms imbibitions or adsorbates even with other solvents.

Phosphatidylcholine and PE are cationic and anionic at the same time, i.e., they are zwitterions. However, phosphatidic acids and their phosphosphingosides and galactosphingosides would be anionic and nonionic, respectively. It is evident, therefore, that commercial lecithin has the structural aspects of an anionic interface modifier.

Stability of Lecithins

(1) Fluid lecithins normally contain 30% to 40% SBO. Soybean oil contains tocopherols, which help prevent rancidity; (2) Moisture in fluid lecithin and deoiled lecithin is a factor that decides the stability. More moisture leads to faster rancidity, which means lesser stability (3) Deoiled lecithins are hygroscopic and are prone to oxidation more by light than by heat. (4) Deoiled lecithins contain 1-2% of residual oil and a fractional % of tocopherols. Lower the oil content, lesser is it susceptible to oxidative rancidity. Therefore, deoiled lecithins are more stable than fluid lecithins. (5) Heat treatment of lecithins (at $>80^{\circ}\text{C}$) under anhydrous conditions tend to darken the lecithins.

Darkening of lecithin is proportional to heating and lecithin is known to decompose above 120°C (6) Good quality fluid lecithin stored below 25°C could be stable for as long as 12 months and (7) Good quality deoiled lecithin, when

Lecithin preparations may be saponified readily by boiling with aqueous or alcoholic solutions of bases or they may be hydrolyzed by boiling with aqueous solutions of strong acids.

stored below 25°C could be stable for as long as 18 months.

Classification of PHTs (Fig 2)

In the colloidal system represented by the mixed PHTs, the micelles represent the higher molecular weight constituents as the disperse phase, and the lower molecular weight constituents represent the continuous or intermicellar

phase.

Though SB PHTs exhibit zwitterion formation and a mutual buffering action, the presence of strong acid components bring the pH of SB PHTs to around 6.6 and react as slightly acid in dispersion in water or in solution in solvents. Isoelectric point of SB PHTs is about pH 3.5.

Chemical Properties

Because of the presence of fatty acid groups in the PHT molecule reactions like saponification, hydrolysis, hydrogenation, halogenation, sulfonation, phosphorylation etc., are possible. Pure PC has the IUPAC and IUB name as: 1, 2 - diacyl-1-Sn-glycero-3-phosphorylcholine.

Lecithin preparations may be saponified readily by boiling with aqueous or alcoholic solutions of bases or they may be hydrolyzed by boiling with aqueous solutions of strong acids. Saponification yields soaps as well as salts of glycerophosphoric acid and inositolphosphoric acid, various amino compounds, glyceryl phosphorylcholine, and carbohydrates. Further decomposition into glycerol, or inositol, and phos-

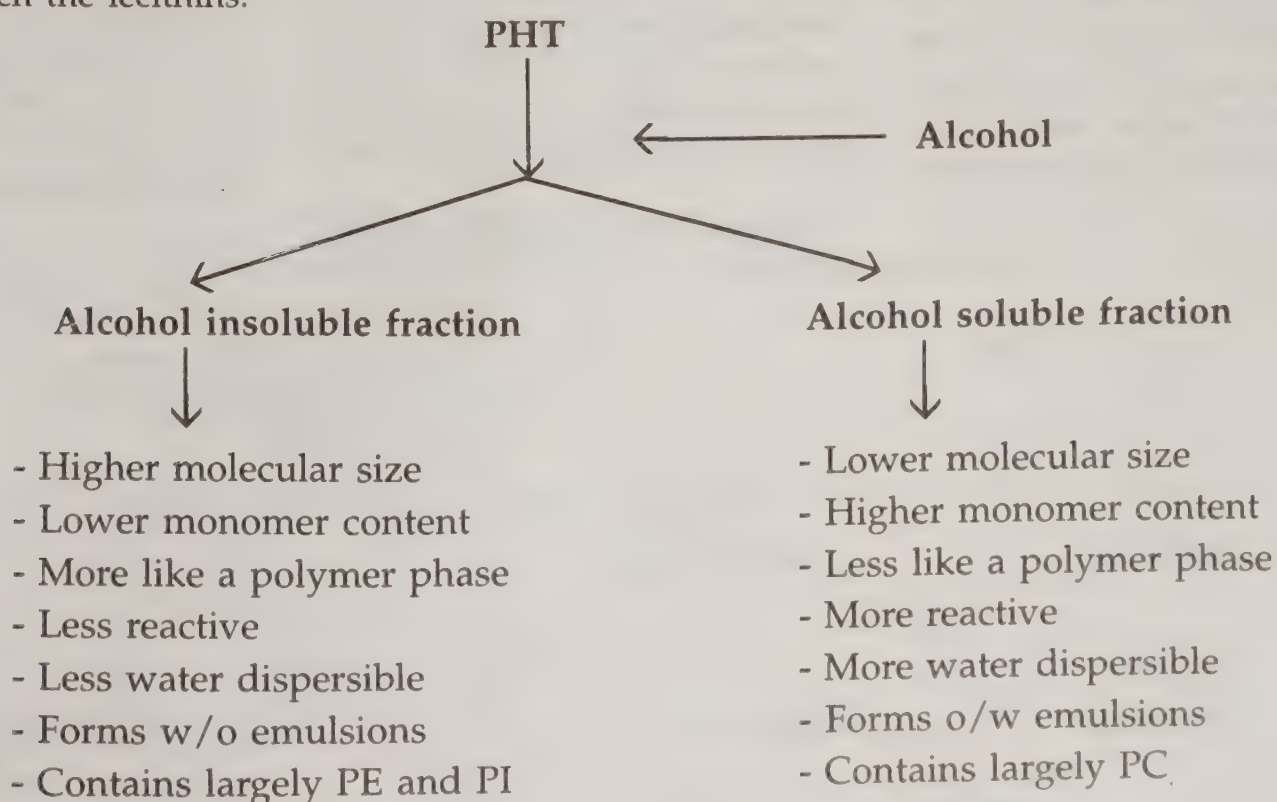


Fig 2. Classifications of PHTs

phoric acid may follow prolonged heating. Acid hydrolysis produces free fatty acids and the free forms of the hydrolytic products mentioned above.

Some reactions of lecithins are listed below:

(1) Lecithin can be saponified by boiling with aqueous or alcoholic solution of bases (2) Lecithin can be hydrolysed by boiling with aqueous solutions of strong acids (3) Saponification of lecithin yields soaps + salts of glycerophosphoric acid + inositol phosphoric acid + various amino compounds + glycerophosphoryl choline + carbohydrates (4) Hydrolysis of lecithin can be either acidic or enzymatic. (5) Acid hydrolysis produces free fatty acids + free forms of the hydrolytic products of the above mentioned products. (6) Enzymes disrupt the carboxylic and phosphoric ester linkages and are therefore esterases and in this case lecithinases / phospholipases (7) The enzymes are very specific in their reaction. They attack the C2 position of glycerol, thereby producing a saturated monoglyceride form of lecithin called lysolecithin. Normally, most unsaturated fatty acids are present at C2 position. (8) Lecithin on hydrogenation in the presence of nickel catalyst gives a white stearin-like solid. (9) Lecithin gets hydroxylated in the unsaturated fatty acid chain in the presence of

peroxide / acids like lactic or acetic and gives hydroxylated lecithin. (10) Lecithin on halogenation (chlorine/ bromine) of the unsaturated fatty acid group gives halogenated lecithin (11) Lecithin on sulfonation, with sulfuric acid / chlorosulphonic acid, which are also strong dehydrating agents, tends to get carbonised. (12) Lecithin in the presence of sulfur dioxide and aldehyde / ketone / phenol gets sulphonated lecithin where - CHO, C=O, Ph-OH form integral part of lecithin. Sulphonated lecithin forms clear solutions in water and are resistant to precipitation by acids and salts. (13) Phosphatidyl amino ester (one of the PHTs of SB lecithin) in the presence of salts of heavy metals like Cd, platinum and Hg chloride gives additional compounds. (14) Phosphatidylethanolamine in the presence of acetic anhydride combines with the amino group to give acetylated compound. (15) Phosphatidylcholine in the presence of salt of cadmium chloride gives an additional compound of PC. This helps isolate and identify PC. (16) Phosphatidylethanolamine in the presence of salt of platinum chloride gives an addition compound of PE. This helps isolate and identify PE. (17) Phosphatidylinositol in the presence of salt of mercuric chloride gives an addition compound of PI. This helps isolate and identify PI. (18) Phosphatidylethanolamine and PI have

affinity for Ca^{++} and Mg^{++} because of their interaction with the polar groups and (19) Lecithin forms coacervates with many substances, including carbohydrates, proteins, alkaloids, salts, dyes, enzymes, etc. A coacervate of sodium chloride and lecithin is soluble in ether. The certified, water soluble food colours may be blended with oils and fats by coacervation with SB lecithin.

Sometimes, PHTs are not recovered from crude SBO. Then their fate is explained schematically as given in Fig 3.

Manufacturing and processing steps of lecithin are given in Fig.4.

Supercritical CO_2 extraction of components of PHTs like PC, PE, PI, PS could be an important study. Handling high pressures of gas and high costs of equipment are reasons why this method of extraction is not commercially viable for SB PHTs. However, this could be an option for manufacture for the not so common egg PHTs. This process of manufacture will ensure zero solvent residues in the PHTs.

Commercial Grades

There are six commercial grades of lecithin viz., the unbleached, single-bleached, and double-bleached lecithins of plastic consistency and of fluid consistency. Commercial lecithin (mixed PHTs with oil carrier) that is recov-

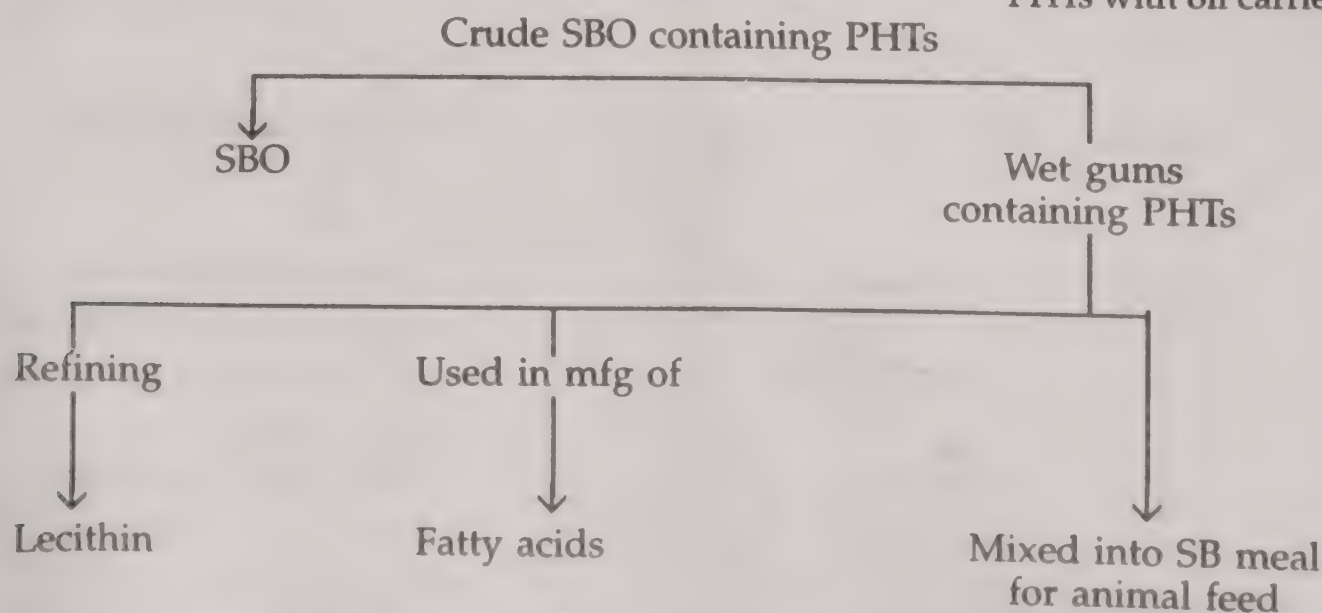


Fig 3. Recovery of Phosphatides from Crude Soybean Oil

* Source : Kirk Othmer (1981)

Soybean Lecithin - Its Manufacture, Properties and Applications

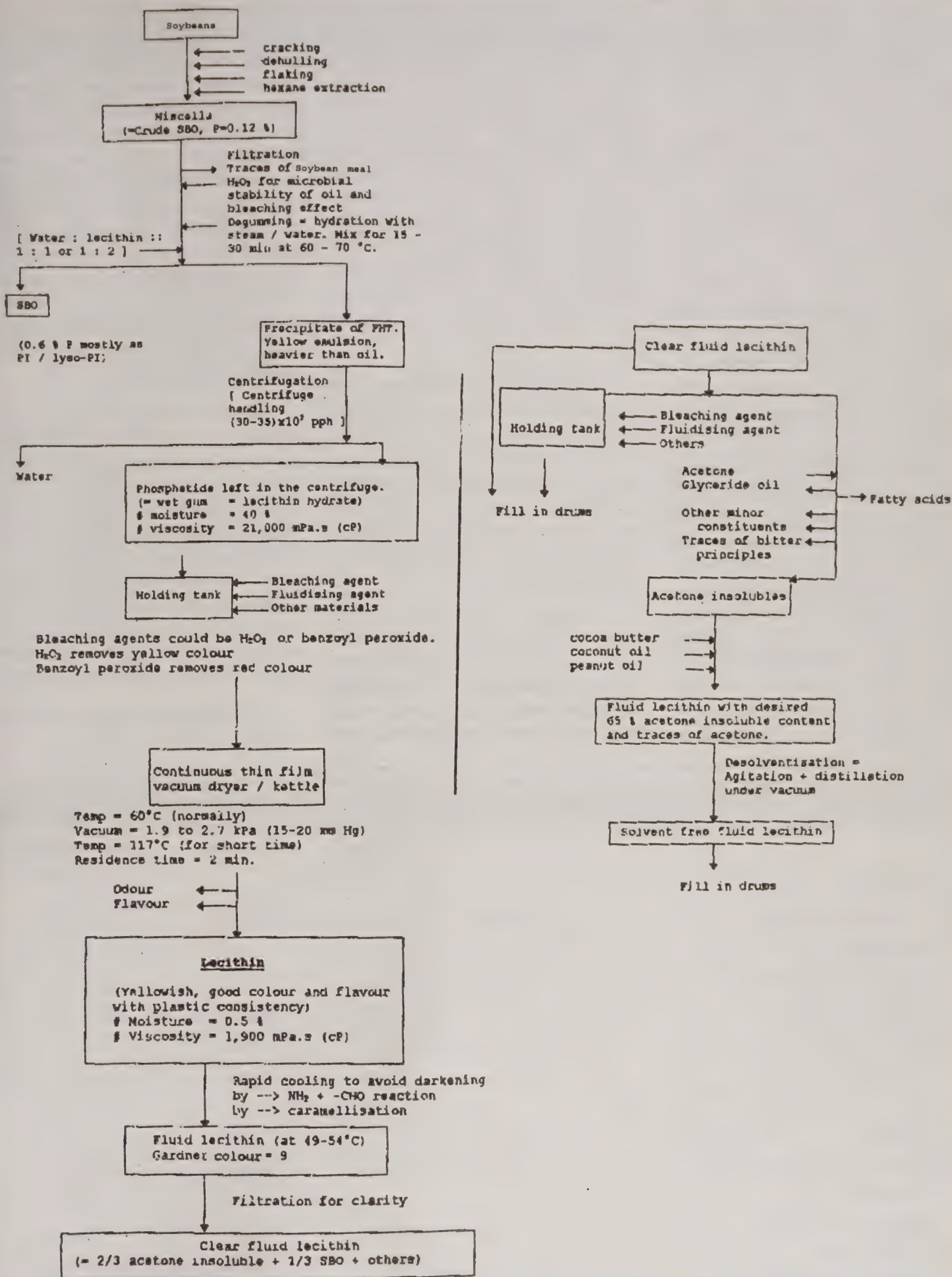


Fig 4. Manufacturing and Processing of Lecithin

Soybean Lecithin - Its Manufacture, Properties and Applications

ered directly from the crude oil tends to be of plastic consistency.

Plastic type lecithin is made fluid by, (a) increasing the free fatty acid content (2) using mineral acids like phosphoric acid (3) using organic / inorganic acid that is soluble or dispersible in lecithin (4) complexing with divalent salts like CaCl_2 and (5) lowering fatty esters of fatty acids.

The HLB (hydrophile-lipophile balance) of ordinary commercial lecithin (fluid natural) is about 3.6 by GLC technique.

Typical specifications for the commercial soy lecithins are given in Table 3.

The *Food Chemical Codex* definition of lecithin describes that lecithin (i.e., commercial lecithin) is obtained from SBs (it can also be obtained from other oilseeds) and is a complex mixture of acetone - insoluble PHTs, comprising mainly of PC, PE, PS and PI, combined with various amounts of other substances such as triglycerides, fatty acids and carbohydrates.

Refined grades of lecithin may

contain any of these components in varying proportions and combinations, depending on the type of fractionation used. In its oil-free form, the preponderance of triglycerides and fatty acids are removed and the product contains 90% or more of soy PHTs representing all or certain fractions of the total PHT complex, the acetone-insoluble matter (PHTs) should not be less than 50%, the moisture not more than 1.5%, and the benzene-insoluble matter not more than 0.3%.

Oil-free phosphatides are prepared by acetone extraction and are then redissolved in a variety of carriers, e.g., refined glyceride oils and fats, glycerol monostearate, refined mineral oil and benzyl alcohol. The PHT content, acid value and colour can be adjusted to meet the required specifications.

Deoiled (oil-free) PHTs (granular lecithin or powdered lecithin, > 95% acetone insoluble) are also manufactured. These are made from ordinary commercial lecithin by extracting the SBO with

acetone, followed by processing and drying the residue. They are sold in the form of amber-coloured granules or powder that keep well under atmospheric conditions, if protected from moisture and light. Soybean oil (1-2%) is left in the acetone-extracted phosphatides to improve the stability and 0.1-0.2% of tocopherols are usually added for stability, as much of the natural tocopherol present in the commercial lecithin is extracted by acetone. The deoiled PHTs readily hydrate and emulsify to form highly dispersed emulsions.

Other commercial types of lecithin are made by mixing ordinary lecithin with a variety of substances such as synthetic detergents, glycerol monostearate, etc. These are used for special purposes and some of the mixtures are patented. An industrial-grade, water-dispersible lecithin when made by mixing ordinary lecithin with nonionic and anionic surfactants can be used in water-based paints.

Composition of some oil-free lecithins is given in Table 4.

Table 3 : Typical Commercial Soybean Lecithin Specifications

		Neutral	Bleached	Unbleached
Fluid				
Acetone insoluble	% min	62.00	62.00	62.00
Moisture	% max	1.00	1.00	1.00
Benzene insoluble	% max	0.30	0.30	0.30
Acid value	max	32.00	32.00	32.00
Colour, Gardner	max	10.00	7.00	4.00
Viscosity at 25° C (= P/10) max	Pa.s	15.00	15.00	15.00
Plastic				
Acetone insoluble	% min	65.00	65.00	65.00
Moisture	% max	1.00	1.00	1.00
Benzene insoluble	% max	0.30	0.30	0.30
Acid value	max	30.00	30.00	30.00
Colour, Gardner	max	10.00	7.00	4.00
Penetration	mm max	22.00	22.00	22.00

Table 4: Composition of Some Oil-free Lecithins (%)

	Soybean	Peanut	Egg
PC	22	23	73
PE	23	8	17
PS	2	--	--
PI	20	17	1
PA	5	2	--

Source: Lucas Meyer (1990)

Analysis and Test Methods

The *Official and Tentative Methods of the American Oil Chemists' Society (AOCS)*, is a guiding book, giving standard methods by which the technical evaluation of commercial lecithin is normally done.

Some Important Parameters Which are Analysed

Acetone-Insoluble Content

The analysis is done excluding benzene-insoluble matter, moisture, and volatile matter. This provides a quick measure of PHT content.

Benzene (or petroleum ether) - Insoluble Content

This is done routinely to measure the residual meal fines or extraneous matter.

Moisture Content

This is done by (a) heating at 105°C / 1 hour in oven or (b) by Karl Fisher or (c) by toluene distillation.

Acid Value

This is a measure of both free fatty acids and the titratable acidity of the PHTs.

Viscosity

This value depends on the PHT content, moisture, acidity, type of carrier, and temperature.

Colour

This value varies with the soybeans, the conditions of extraction including treatment of the crude oil, dehydration and the use of bleaching agents. Carotenoid and melanoid pigments are also sometimes present.

Peroxide Value

This value in fluid, unbleached lecithin normally is close to zero. However, after bleaching, column chromatography shows the presence of a large number of substances and may provide reliable quantitative as well as qualitative estimates of principal components including glycolipids.

Phosphorus Content

Volumetric method of estimating phosphorus in lecithin and lecithin-containing products is based on ashing the sample, converting the phosphorus to monophosphate, and titrating with standard uranyl nitrate solution. Unless a pure lipid is being analyzed, samples first should be extracted with a suitable solvent and the phosphorus content should be determined using a solvent-free extract.

Health and Safety Factors

The PHTs are biodegradable and metabolizable, but their presence in streams and water re-

sources, especially in the form of soap stock, are undesirable. Fatty acid recovery from PHTs is less than with neutral oils because of the lower fatty acid content. There are no known health hazards involved in the production of commercial lecithin from crude vegetable oils, because the PHTs are non-volatile and are non-irritating food material. Use of benzoyl peroxide required in the manufacture of highly bleached grades must be done with care and care must also be taken in the acetone or alcohol fractionation of crude lecithin in the manufacture of purified grades.

Uses

Animal Feeds (Dosage approx 1-3%)

In animal feeds, lecithin is an emulsifier, wetting and dispersing agent, caloric source, antioxidant, surfactant, source of choline (organically combined phosphorus, and inositol) and lipotropic agent. It enhances antibody production. It is a milk replacer for calves and for veal production, in mineral feeds, poultry feeds, fish foods, pet foods, and feeds for fur-bearing animals.

Baking Products and Mixes (Dosage approx 0.1-0.5%)

Lecithin is an emulsifier, stabilizer, conditioning and release agent and antioxidant. In yeast-raised

doughs, e.g., it improves moisture absorption, ease of handling, fermentation tolerance, shortening value of fat, volume and uniformity and shelf life. In biscuits and crackers, pies and cakes (1-3% based on shortening), lecithin promotes fat distribution and shortening action, facilitates mixing and acts as a release agent.

Candy

(Dosage approx 1% based on fat)

In confections made with oil or fat lecithin emulsifies and distributes fat in caramels, nut brittles, nuggets, etc. It also prevents fat separation and greasiness. It has fixative action for flavours.

Cheese Slabs

(Dosage approx 0.05-0.3%)

Lecithin helps in release of cheese from the slabs.

Chewing Gum

(Dosage approx 0.5%)

Lecithin is an emulsifier and conditioning agent for gum base. This helps in the retention of moisture in bubble gums and chewing gums, thus making them soft even in low humidity areas.

Chocolate

(Dosage approx 0.3-0.5%)

Lecithin is a wetting agent and emulsifier. It facilitates mixing, saves processing time and power, saves cocoa butter, stabilizes viscosity, increases shelf life, counteracts moisture thickening and aids release of molded goods.

Cosmetics and Soaps

(Dosage approx 1-5%)

It moisturises, emulsifies, stabilizes, conditions, softens, as in skin creams and lotions, shampoos and hair treatments, liquid and bar soaps.

Dehydrated Foods

(Dosage approx 0.05-0.3%)

Lecithin is a release agent in drying and it aids in reconstitution.

Dyes

(Dosage approx 0.5-2%)

Lecithin is a coupling agent, especially for water-soluble colours in fatty media.

There are no known health hazards involved in the production of commercial lecithin from crude vegetable oils because the PHTs are non-volatile and are non-irritating food material.

Edible Oils and Fats

(Dosage approx 0.01-2%)

Lecithin is used as an emulsifier, wetting agent and antioxidant; extends shelf life, especially animal fats; increase lubricity (shortening value); improves stability of compound shortenings and lowers cloud point of vegetable oils.

In biscuits & crackers, pies and cakes (1-3% based on shortening), lecithin promotes fat distribution and shortening action, facilitates mixing and acts as a release agent.

Food:

Lecithin is a dietary addition, rich in polyunsaturated PC, PE, PI, and organically combined phosphorus, with emulsifying and antioxidant properties. It enhances fat and vitamin A absorption.

Ice Cream

(Dosage approx 0.15-0.5%)

Lecithin emulsifies, stabilizes, improves smoothness and melting properties and counteracts sandiness in storage.

Instant Foods

(Dosage approx 0.5-3%)

In instant foods, lecithin is used for wetting, dispersing, emulsifying and stabilizing in beverage powders and mixes including milk powders, dessert powders, powdered soups, etc.

Insecticides

(Dosage approx 0.5-5%)

Lecithin is used for improved emulsification, spreading, penetration and adhesion.

Inks

(Dosage approx 0.5-3%)

Lecithin is a wetting, dispersing and suspending agent promoting uniformity, colour intensity and ease of remixing (especially printing inks).

Leather

(Dosage approx 1-2%)

Lecithin is used as an emulsifier and a penetrating and conditioning agent; it promotes absorption of fat liquor and enhances suppleness. It improves softness and appearance of fur.

Macaroni and Noodles

(Dosage approx 0.25-0.50%)

It is used as a conditioning agent and antioxidant, improves machining, counteracts disintegration and syneresis. It improves colour retention.

Margarine

(Dosage approx 0.15-0.5%)

It is an emulsifier and an antispattering and browning agent; it improves frying properties and spreadability and shortening action in table margarine. It is also used in bakers' margarine.

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Paints

(Dosage approx 0.5-50%)

Lecithin is a wetting agent, dispersing agent, suspending agent, emulsifier and stabilizer paints. It facilitates rapid pigment wetting and dispersion, saves time in grinding and mixing, permits increased pigmentation, stabilizes viscosity, aids in brushing, and improves remixing after storage.

Petroleum Products:

(Dosage approx 0.005-2%)

It is used as an antioxidant, detergent, emulsifier, and anti-corrosive agent and for lubricity and antiwear. It is added to gasoline to stabilize tetraethyllead and for inhibition and anticorrosive effects. After reaction with aliphatic amines, it is used as a detergent in motor oils for inhibiting, detergent and lubricity effects. Also, it is used in miscellaneous oils including household lubricants and cutting oils, in fuel oils for surfactant and inhibiting effects and in drilling muds as an emulsifier.

Pharmaceuticals

Lecithin is used especially as a dietary source of polyene PC required in lipid metabolism including enzyme systems involved in cholesterol metabolism, for the turnover of fats in the liver and as a precursor of brain acetylcholine neurotransmitter. Dosage ranges from 5 g/day for substantially pure SB PC to as high as 60 g/day for whole, mixed, substantially oil-free SB PHTs (containing about 25% PC) in liver disorders, in cardiovascular disease, in neurologic disease associated with impaired acetylcholine function, in skin disorders involving deranged lipid metabolism e.g., psoriasis, in telangiectasia, in nervous tension derived from protracted physical fatigue and as an emulsifier and wetting agent e.g., penicillin dispersions and in emulsions for intravenous application,

when solubilized in water and is effective in some conditions in smaller amounts than the polyene PC given orally. Phosphatidylethanolamine may be methylated in the body to form PC. Soybean phospholipids contain a blood-clotting factor, sometimes termed as vitamin Q, which improves prothrombin consumption time and normalizes bleeding time when added to the diet of patients having a hereditary bleeding state characterized by a moderate thrombocytopenia, a defective prothrombin consumption time and prolonged bleeding time. Evidence for existence of this vitamin was based on experimental, clinical and therapeutic observation.

Lecithin is a dietary addition, rich in polyunsaturated PC, PE, PI and organically combined phosphorus, with emulsifying and antioxidant properties.

Plastics

(Dosage approx 0.5-1.5%)

Lecithin is used for pigment dispersion and as a slip or release agent. It also may be sprayed on molds. It has surfactant effects in organosols and plastisols.

Release Agents

(Dosage approx 2-10%)

It is used as a surfactant and antisticking agent in sprays for cookware and in lubricants and release agents for general food application and for industrial purposes.

Rubbers

Lecithin is a wetting and dispersing agent and mold-release

agent. It increases plasticity and facilitates working. It emulsifies latex mixes and aids in preparing solvent dispersions and in vulcanizing.

Sealing Compounds

It is used for wetting, dispersing and plasticizing effects.

Textiles

(Dosage approx 0.2-0.5%)

Lecithin is used for emulsifying, wetting, softening, and conditioning especially in sizing and in finishing. It imparts soft, smooth handle. It is also used as a spray to reduce cotton dust.

Whipped Toppings

It is used as an emulsifier.

Antinutritional Properties of Lecithin

Toxic substances can arise upon oxidation of lecithin and also upon reaction of lecithin with sodium nitrite at elevated temperatures. Radical chain oxidation products can cause structural and metabolic disorders when ingested by rats. These disorders are accompanied by an increase of lipoperoxide content in the liver, a decrease of the lipid bioantioxidant quality in tissues of internal organs, destructive changes of the cellular microstructure of the liver and intestinal tissues and in a number of cases, by cell death. The reaction between commercial lecithin samples and nitrite examined in a model system under conditions, simulating processing of some meat products was found to produce the carcinogen, dimethylnitrosamine. Encyclopaedia of Food Science (1978) Food FIPP Magazine (1989 and 1991).

Physico-chemical properties, minerals and vitamin contents of commercial lecithins are given in Table 5.

Labelling

In the United States:

Products labelled "Lecithin" are Generally Recognized As Safe (GRAS) under 21 CFR 184.1400 and specifications of the *Food Chemical Codex*. The FDA-preferred labelling is "Soy Lecithin" although "Lecithin" is generally considered as the common and usual name. One exception is lecithin which has been hydroxylated. This must be labelled "Hydroxylated Soy Lecithin" or "Hydroxylated lecithin". Another exception is enzymatically modified lecithin. This is labelled as "Enzymatically Modified Lecithin". Lucas Meyer (1990).

In the EU

Although lecithins are of natural origin and are also marketed as dietetic foods, the regulatory authorities have accorded lecithin the status of additives only.

European Council Directive 74/329/EEC as amended in the Directive 85/6/EEC lists lecithins E 322 as generally approved additives. These also include enzyma-

tically hydrolysed lecithins.

Lecithins are to be identified in one of the following ways:

- Emulsifier lecithin
 - Emulsifier E 322
 - Emulsifier Lecithin E 322
- Lucas Meyer's (1990)

Although lecithins are of natural origin and are also marketed as such as dietetic foods, the regulatory authorities have accorded lecithin the status of additives only.

In India

As per the Prevention of Food Adulteration Act, 1954 (Rule 60) lecithin falls under the chapter of emulsifying and stabilising agent. Here, the definition of emulsifying and stabilising agents means substances which, when added to food

are capable of facilitating a uniform dispersion of oils and fats in aqueous media or *vice-versa* and / or stabilising emulsions.

Prevention of Food Adulteration Act, 1954 and Prevention Food Adulteration Rules, 1955.

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Prevention of Food Adulteration Act, 1954 (1996) 17th edn. Eastern Book Co., Lucknow, pp 94-95.

Table 5. Physico-chemical Properties, Mineral and Vitamin Contents of Commercial Lecithins

Property	Value
Iodine value	95.00
Saponification value	196.00
Sp. gr. at 25°C	1.03
pH	6.60
Isoelectric point, pH	3.50
Ash, %	7.00
Total nitrogen %	0.80
Amino nitrogen %	0.40
Phosphorus %	1.90
Unbound carbohydrates %	5.00
Choline %	2.20
Inositol %	1.40
Tocopherol %	0.10
Sterols and steroglycosides %	3.50
Moisture %	0.75
Other mineral matter (mostly potassium) %	1.75

* Kirk Othmer (1981)

NEW MACHINERY

Water/Air Purification Systems

BN Consult has developed ultraviolet (UV) and ozone sterilisation systems for cleaning water and waste water without using chemicals. This UV and ozone treatment of water and other clear liquids can eliminate bacteria, undesirable micro-organisms, sponge, spores, viruses, etc. Ozone has the property of combining with organic substances which subsequently dissolves into carbondioxide and other biodegradable molecules. By combining UV and ozone, a photochemical oxidation is produced which is very suitable for purifying of water polluted by chemicals. Air cleaning by means of UV and ozone is specially developed in order to eliminate the smell and bacteria from the discharged air on suction plants within the area of production and preparation of foods for human beings and animals and in hospital clean rooms. UV and ozone air cleaning is a revolutionary innovation in smell elimination and most effective method so far in eliminating unpleasant smells from discharge air of the suction plants. The systems is useful in hospitals, food processing industry, fishing farms, swimming pools, metro water works, sea water, recycling of waste water, recycling of cooling water for machines, private wells, etc.

For more details write to :
Power Green
A Division of IAEC Industries
Madras Ltd.
Rajamangalam, Villivakkam,
Chennai - 600 049

Digital Oxygen Meter

MRK Engineers offers digital oxygen meters for dissolved oxygen, oxygen in air, and temperature. The compact portable meters find applications in aquariums, medical research, agriculture, fish hatcheries, laboratories, water conditioning, mining, quality control departments, etc. It uses polarographic probe sensor with an incorporated temperature sensor. Sensor temperature compensation is automatic from 0°C to 40°C. It works on 9 V DC battery (heavy duty).

For more details write to :
MRK Engineers Pvt Ltd
638/3, Ground Floor,
13th Cross, M.C. Layout,
Vijayanagar ,
Bangalore - 560 040, Karnataka

Spice- Powdering Plant

Finex has introduced spice-powdering plants in 1-3 tonnes/hr capacities. Consisting of six sections - precleaning (with fumigation, if necessary), cleaning, drying, milling, blending and packing (automatic form-fill-seal machine), the plant gives a spice powder yield of 85 per cent. Cryogenic cold-grinding spice plants are also offered.

For more details write to :
Finex Sileves Pvt Ltd
606 GIDC, Makarpura,
Vadodara - 390 010,
Gujarat

Tray Drier

Kapoor International offers a tray drier fabricated from sturdy MS angle frame and double chamber wall. This model K-106 finds applications in industries like chemical, dyestuff, pharmaceutical and plastic and wherever heat drying process is involved. It is sealed with asbestos and fitted with an electronic controller. Also, it is electrically heated and glass wool layer between the two chamber walls prevents heat loss. It is designed for forced and crossed air circulation with a provision to accommodate 12, 24 and 48 drier trays.

For more details write to :
Kapoor International
22/23 Vishnu Indl. Estate,
Masrani Lane,
Halav Pool, Kurla (West),
Mumbai - 400 070

Educational Charts

Bio-Visual offers screen printed educational charts on various subjects such as botany and engineering. The range is now extended to biotechnology, microbiology, genetics and agricultural engineering. The charts are made water proof, reinforced with PVC sheeting (rexine), which is flexible and wrinkle-free. This makes the charts durable.

For more details write to :
Bio-Visual Products
1-5-7/1, Musheerabad,
Hyderabad - 500 020

Double-Arm Mixer-Cum-Kneader

The Fabdecon double-arm-mixer-cum-kneader is a highly engineered machine used for mixing and kneading high viscous and pasty material, and is available in 10-2,000 litre capacity. The mixing action is a combination of bulk movement, smearing, stretching, folding, dividing and recombining as the material is pulled and squeezed against blades and the walls of the container. The mixer finds applications in a wide range of industries, including confectionery, rubber, soaps and detergents, paint, chemical, fibreglass, brake lining, ceramic, carbon and insulation. Available in mild and stainless steel, alloy steels, Hastelloy and abrasion-resistant materials, the mixers offer the following options: vacuum design, jacketed trough for heating or cooling, variable speed drives and different blades designs (Sigma, 135° spiral single curve, 180° spiral single curve, double Nobben and MOWL types). An efficient sealing system prevents extraneous material like bearing lubricants from leaking into the mixing zone and special seals can be provided for high-vacuum application and for abrasive material mixing. Material is discharged by tilting the container manually, mechanically or hydraulically, or through the bottom valve, operated manually/pneumatically, or through an integrally incorporated extruder.

For more details write to:
Fabdecon Engineers
138, Damji Shamji Indl. Complex,
Off Mahakali Caves Road
Andheri (East)
Mumbai - 400 093

Antistatic Floor Cleaner

Antistatic floor cleaner from Cir-Q-Tech is specially designed liquid cleaner for the purpose of washing the antistatic/conductive PVC floors. It is neutral in pH value with no ionic residues left behind after the floor is cleaned using the liquid. The floor cleaner has disinfectant characteristics for hygienic reasons. The speciality of this liquid is its capability to re-vamp the static dissipative properties of the floorings to meet the demands of the static control measures in electronic and related applications.

For more details write to :
Cir-Q-Tech Engineering
No.20/2, 80 Ft. Road,
4th Block, Koramangala
Bangalore - 560 034

Flame Detectors

Sierra Monitor Corporation, USA, has introduced flame detectors that use the ultraviolet, infrared and visible spectra for continuous and reliable flame detection. The multi-spectrum detection system, coupled with state-of-the-art algorithms in the microprocessor controls, results in highly reliable flame detection, avoiding false alarms. Easy-to-understand diagnostics, variable alarm relay configuration, automatic built-in through-the-lens testing and a wide field of view (120°) are the other features. The self-diagnostic features perform system tests and watch for faults that could impair its ability to accurately detect a flame. The model 3100 is FM-approved, is in a copper-free, cast-aluminium explosion-proof housing,

and comes in five models. While the basic units include fire and fault relays, the enhanced models include fire and fault relays plus 'verify' and auxiliary relays. The flame detectors are particularly useful in petrochemical and chemical facilities, aerospace industries and any industry where hydrocarbons, hydrogen, hydrazine, alcohols, etc are used.

For more details write to :
Silicon Sensors Pvt Ltd
A-61 Electronics Sadan No.1,
3rd Floor, TTC Indl. Area,
Mahape,
Navi Mumbai - 400 701

Environment-Friendly Fire Extinguisher

Sicli have developed the Aqua Fortex water with additive extinguisher for Class A and Class B fire. The unit's effectiveness in dealing with a smouldering fire is due to its user-friendliness and the specific characteristics of the extinguishing agent. Both the 61 to 91 versions of Aqua Fortex have been specially designed for maximum effectiveness on Class A fires, which account for 90% of smouldering fires and on Class B fires, too. In short, the Aqua Fortex extinguisher is environment friendly, as it is clean, biodegradable and dielectric.

For more details write to :
Sicli SA
Rue du Merlo 1,
B-1180, Brussels,
Belgium

Permanent Scale Inhibitors

The Biosphere permanent inhibitors prevent scale build-up and remove scale in hard water areas. The removal of scale increases heat transfer efficiency, reduces fuel and maintenance costs and extends equipment life. The absence of scale also laminates the "accommodation" for bacteria to breed in, reducing the potential for bacterial infections by keeping systems clean in accordance with HS (G) 70 guidelines. Features include : installed in seconds, no power required, no wear-out, maintenance-free, self-monitoring, re-usable, and works on all pipe materials.

For more details write to:
Kemtech International Ltd.
A-125, Shivalik,
Malviya Nagar
New Delhi - 110 017

On-Line Water Softener/Tester

Prerana Laboratories has developed a Softener-Tester for on-line testing of softening plant water for commercial zero hardness for oiler feeder water, etc. The simple testing involves releasing the calibrated amount of softener-tester reagent (CZ) in the sample water in the observation-tube to get red or blue colour. Blue colour indicates commercial zero hardness (less than 5 ppm) and red hardness more than 5 ppm (hard water). The unit can be installed on the softener with only a flexible pipe connection to sampling point. Models for domestic softeners (with indications for 10 ppm or 50 ppm hardness) are also available.

For more details write to:
Prerana Laboratories
C-17, Meghali, Orion Complex,
Opp. Gahesh Mandir
Aundh Road, Khadki,
Pune - 411 003.

Gas Liquid Chromatographs

Sigma Instruments Pvt. Ltd, a company specialising in chromatography, offers a range of models from tiny mini models to the latest microprocessor based models for meeting every application. All the models incorporate international state-of-the-art technology and have been designed to give high reliable performance. The instruments are built to accept both packed and capillary columns with a wide range of detectors. The simple models are easy to operate and can carry out all routine analysis accurately. On the other hand, the more sophisticated models offer greater flexibility to meet varied applications in routine or research. All models are ruggedly built and can face any day-to-day challenge most effectively and with minimum down time. Additional features such as sampling valves, column switching, back flushing and a choice of data handling equipment are all catered for.

For more details write to:
Sigma Instruments Pvt Ltd.
201, Rajvee Towers,
Old Padra Road,
Tandalja Junction,
Vadodara - 390 020.

Drying Machine

Kapoor International manufacturers a drying machine, the Model K-205, incorporating a conveyor for efficient loading and transporting of products which are required to be dried. When the products are placed on the conveyor, it is carried into the tunnel. The tunnel is fitted with heaters and hot air circulation in the area which provides rapid heat transfer. The machine is fitted with an electronic controller with a range up to 250°C. The speed of the conveyor can be controlled by an electronic thyrostat controller. The machine finds applications in the chemical, pharmaceutical, leather, electronic, printing, rubber and textile industries.

For more details write to:
Kapoor International
22/23 Vishnu Indl. Estate,
Masrani Lane,
Halav Pool, Kurla (West)
Mumbai - 400 070

Non-IBR Fully Automatic Coil Type Boiler

Fuelpac Boilers Pvt. Ltd. offers a wide range of steam boilers, hot water boilers and thermic fluid heaters. Utmost care is taken in the designing parameters like temperature dynamics, heat transfer, combustion volumes, thermal efficiency, ease of operation, maintenance aspects, safeties and are appropriately tuned for the optimum performance and environment friendly efficient boilers. Non-IBR steam boilers oil, gas or dul fired from 100 kg/hr to 850 kg/hr with working pressure up to 15 kg/cm².

are manufactured from high quality steel, seamless pipes with unique burner design. Compact design occupies less space and is installed with negligible foundation. Clear four design with built-in economiser absorbs maximum possible heat from waste heat gases, eliminates dissolved gases resulting into higher thermal efficiency saving in fuel cost and avoiding water side corrosion. Long flame path offers high residence time ensuring maximum heat transfer.

For more details write to:
Fuelpac Boilers &
Engg. Co. (I) Pvt. Ltd.
H/94, Gujarati Society,
Nehru Road, Vile Parle (East),
Mumbai - 400 057

Residual Chlorine Measurement System

Bela Instruments (BI) offers, in association with Great Lakes Instruments (GLI), residual chlorine measurement system that meets the requirement of the most difficult industrial application. The GLI free residual chlorine system is designed to monitor and control free residual chlorine and pH in clean water applications. The system is ideal for monitoring free residual chlorine in drinking water treatment, food and beverage process. This three sensor 95CL/CLI 100 free residual chlorine monitoring system uses a membrane style sensor, a pH electrode, and a thermistor to measure free residual chlorine in water. The unique instrument design allows for the determination of free residuals without the use of expensive reagents and buffers. Features of the

instrument are: displays and provides 4-20 mA outputs for free residual chlorine, pH, HOCl, and temperature; automatic temperature and pH compensation; pre-plumbed sampling assembly.

For more details write to:
Bela Instruments
6/309, Jogni Industrial Complex,
Chunabhatti, Mumbai 400 022

Spiral Vibrator Feeder

La'mina offers spiral vibrator for feeding dry granular material continuously to reactors, furnaces, tanks, etc at a low rate. Consisting of a feed hopper, vibrator hopper feeder with special track design and a separate controller unit suitable for 230 V AC, the unit can be housed in a vacuum-sealed system. Other vibrator devices offered are in vibrators, linear feeders, parts feeders, vibrator conveyors, compacting tables, etc.

For more details write to:
La'mina Pvt Ltd.
1-15, Zakaria Indl. Estate,
Marol Maroshi Road,
Andheri (East),
Mumbai - 400 059

Self-Priming Slurry Pumps For Effluent Treatment and Corrosive Chemicals

Unipump has developed all-SS and polypropylene self-priming slurry pumps for effluent treatment in chemical, pharmaceutical, petrochemical, electroplating and al-

lied industries. Features include: fully automatic self-priming design; will lift up to 3 m depth; non-clogging; can handle slurries, sludge and solid up to 10 mm; no chance for solids to settle; and energy-efficient pump. Capacity ranges from 20 to 1000 LPM and head from 2 to 20 m.

For more details write to:
Union Enterprise
113, Nagindas Master Road,
Fort, Mumbai - 400 023

Mixtruder

The Fabdecon Mixtruder is designed for mixing and extruding almost every type of material in plastics, rubber, food, drugs and chemical industries. The sigma-type mixer has a screw in the bottom for unloading or extruding the mixed material. During mixing, the extrusion screw is driven in reverse by a separate motor; this pushes the material into the mixing zone and within reach of the blades for thorough blending of all the ingredients and, at the same time, reducing the mixing time compared to a standard sigma-type mixer. For discharging the material, the screw is driven forward and the mixed material unloaded through the extension barrel. Extremely tough materials such as filled thermosetting resins and bulk moulding compounds are handled easily, as also scores of other materials. The main mixing elements and the extruder have different drives and can operate independently. Capacity ranges from 25 to 2,000 litres. The unit can be supplied in various materials - carbon steel, all grades of stainless steel, alloy steels, Hastelloy, abrasion-resistant Tiscral, etc.

For more details write to :
Fabdecon Engineers
138, Damji Shamji Indl Complex,
Off Mahakali Carves Road
Andheri (East), Mumbai - 400 093

Air Compressor

Tarapore and Associates offers the Pneu-Pack air compressors which are single stage, splash lubricated, air cooled, deep-finned with balanced V-construction. These compressors are available with displacement capacities of 13.5 CFM to 45 CFM, maximum pressures up to 150 PSI and receiver capacities up to 300 litres. The cast cylinders are easily removable cylinder heads and closely finished. Specially forged crankshaft is precision balance-fitted with heavy duty roller bearing on both sides. Special forged connecting rod is with integral splash lubrication. Aluminium alloy pistons fitted with compression rings and ventilated oil control rings provide perfect dynamic balance. Finger plate type steel valves with large flow area assures long trouble-free life. Auto start and stop at predetermined pressures are effected through pressure switches. The control is equipped with relief valve to ensure that the compressor starts on "no load" condition.

For more details write to:
Tarapore and Associates
109, Unique House, Cardinal
Gracious Road, Chakala,
Andheri (East), Mumbai - 400 099

Software For Marketing Control

Werhardt's Mark-IT is a product group of software developed to control all marketing activities in any organisation. Mark-IT provides: an exclusive FAR (First Action Report) and FUR (Follow-up Report) for feedback from sales outlets; expected feedback date/time from the customer; order vs expense ratio; produce, region, area and personnel, wise reports on or-

der conversion and sales; analyses; Market Approach and Feedback File for all enquiries; product, branch, dealer, marketing person targets and performances; and mailing list, mail merge, etc.

For more details write to:
Wehardt Systems
E-1225 Shivajinagar, Sameer Apts,
3rd Floor, Off. FC Road,
Pune - 411 004

Viscometers For A Range Of Measurements

The Fann Model 35 Viscometers is an industry standard (API) instrument for measurement of drilling fluid viscosity. It permits a wide range of standard API fluid measurements and is used to obtain apparent viscosity, plastic viscosity, yield point and gel strength of drilling fluids and cements. Measurement ranges are expandable by using interchangeable components such as bobs, torsion springs and rotors, 220 V options are available for most instruments.

For more details write to:
Fann Instrument Co,
Dept. CN
3000 North Sam
Houston Pkwy East
Houston, Texas 77032, USA

Analogue Hand-held Tachometer

Manometer (India) offers compact analogue hand-held tachometers, from Superb Instrumentation, UK, for measuring and checking rotational and linear speeds in workshops, factories, laboratories, service stations, etc.

Available in 4 standard models and accurate to $\pm 0.5\%$ of FSD, it comes in robust plastic case with foam insert and contact pieces.

For more details write to:
Manometer (India) Pvt. Ltd.
Manu Mansion, 16,
Shahid Bhagatsingh Road,
Fort, Mumbai - 400 023

In-Line Flow Indicator

The SB make full view type sight glass (in-line flow indicator) consists of MS with chemical resistance epoxy coated frame, 100% PTFE (Teflon) bushes, washers and borosilicate glass pipe. In check nut design sight glass, any corrosive chemical passing through the non-transparent pipeline comes in contact with PTFE (Teflon) and glass. It does not come in contact with metallic frame. It can work from -250° to $+250^{\circ}\text{C}$. The company manufactures 12 mm NB to 300 mm NB sight glass which can be installed in pipelines in horizontal, vertical or any angle. The limitation of this sight glass is that it can work at low pressure. For pressurised application, the company offers double window type sight glass in various models like plain, drip tube type, turbine blade, flapper type and also in MS, SS or MS with inside rubber/PP/PVDFT/Teflon linings.

For more details write to:
Shah Brothers
218, Saffron Complex,
Opp. Narhari Hospital
Fatehunj,
Vadodara - 390 002

Digital pH Meter

PBS offers digital pH meter, a simple direct-indicating instrument for measuring the pH value of any solution in laboratories as well as in industries (on-line). The instrument has an accuracy of ± 0.05 pH, relative repeatability of ± 0.02 pH, and 3-1/2 digit, 1/2"-height 7-segment LED display, and works on 230 V AC. pH adjustments and calibration can be done with a buffer solution of known value. Also offered are digital conductivity meters, temperature controllers, etc.

For more details write to:
PBS Electronics
10 Dattani 5A, Shivaji Road,
Kandivil (West),
Mumbai - 400 067

Bulk Tanker

Scorpio Engineering offers bulk tankers, manufactured to pressure vessel standard and mounted on truck chassis for road transport and pressurised discharge of material directly into silos. The tankers can handle various powders like flyash, cement, PVC, resin, etc. For pellet and granular materials, gravity, discharge can be offered. The tankers are available in steel/stainless steel/aluminium in top and bottom discharge options.

For more details write to :
Scorpio Engineering Ltd.
209 Daulat Udyog Bhavan,
Wadhavli, Chembur,
Mumbai - 400 074

Custom-Made Expansion Joints

The Dynex Expansion Joints are useful for utility, pulp and paper, steel and boiler industries. The duct-type joints are used for breaching between boilers and smoke-stacks, which relieve movement and vibration. The joints are capital investment products, have a 10-20 year life span, require no maintenance and are easy to install. Virtually any size is available and products are custom-made to suit requirements.

For more details write to:
Dynex, Inc, Dept. CN
101 Expansion Joint Way,
Savannah, Georgia 31405, USA

Industrial Liquid Filters

Ametek of USA offers a range of liquid filter cartridges and housing configurations designed to remove unwanted, unpleasant, unhealthy solid or unseen impurities that might be present in industrial liquids or potable water supplies. The cartridges remove or reduce foul tastes and odours (including chlorine), dissolved minerals, heavy metals (lead, mercury), chemicals and sediment of all types and cysts, it is said. Standard filter housings are constructed of tough, corrosion resistant reinforced poly propylene plastic; others are available in stainless steel. All polypropylene filter housing and bags offer outstanding corrosion resistance at a fraction of the cost of metal fluid, including organic solvents, oils, alkalies and acids. Housings include pressure gauge, drain valve, vent and drain plug. They accept 4" (10.16 cm) x 9.5" (24.13 cm) or 19.5" (19.53 cm) bag filters and provided a normal flow rate of 50 gpm.

For more details write to :
JRD Auto Industries
610, Sector, 4 Urban Estate,
Gurgaon 122 001

High Quality Water Purifiers

The Quality of water is of utmost importance in many applications like high performance liquid chromatography, inductively coupled plasma, atomic absorption, DNA/tissue culture, stills, reagent make-up glassware rinsing, etc. Purite Ltd, UK, an ISO 9001 certified company provides water purifiers which can be used for such applications. The purifiers are built to accept potable water or pre-treated water to produce ultra pure water with deliveries from 1/day to over 4,000/day. Technology such as reverse osmosis, UV sanitisation, deionisation, organic removal, UV filtration, ultra filtration, ion-exchange, etc are employed to purify the water to the required degree. The quality of delivered water can be distilled, deionised HPLC grade, pyrogen free, etc. Recirculation of purified water from the storage tank is also available, thus ensuring purity of even stored water. Water quality can meet British Standards, ASTM Standards and National Committee for Clinical Laboratory Standards (NCCLS).

For more details write to:
Sigma Instruments Pvt Ltd.
201, Rajvee Towers, Old Padra
Road, Tandalja Junction,
Vadodara - 390 020

RESEARCH ROUND-UP

CFTRI Develops Enteral Foods

The Mysore-based Central Food Technological Research Institute (CFTRI) has developed two types of enteral food formulations for general category of patients and for hyper-catabolic patients suffering from burns, trauma and others.

Enteral foods are specially formulated foods meant for those who can't take normal food and the food is administered orally or through tubes.

The foods provide total or partial nutritional support to patients suffering from diseases such as renal and hepatic failures, diarrhoea. AIDS, patients in ICU, coma, severe malnourishment, cancer, short bowel syndrome and others.

The new food formulations have unique features like *in-vivo* transformed ingredients. They also provide total nutritional support to a wide range of patients.

The foods contain pre-digested carbohydrates and protein with proper balance of amino acids and lipids with EFA and protective nutrients. The foods are rich in prophylactic bacteria, wound healing and immunomodulator components and dietary fibre from natural sources.

The process involves *in vivo* biotransformation of raw materials followed by milling and blending. Finally, the product is cooked and spray dried.

The foods have been tested for their efficacy on a wide range of patients ranging from paediatric to geriatric age groups at reputed hospitals in Mysore, Hyderabad, Vellore and Mumbai.

The process of manufacturing of enteral food is covered presently by two Indian patents. The CFTRI will release the process know-how and patent rights to interested firms/pharmaceutical industries on mutually agreeable terms.

For details contact: Director, CFTRI, Mysore - 570 013

Features of Laboratory Kit For Aflatoxin Detection Developed at CFTRI, Mysore

The aflatoxin detection kit designed at CFTRI, Mysore can detect as low as 20 ppb of aflatoxin B1 in samples by a simple method and in a short time. 20 ppb is the safe limit set by the FDA. The Kit consists of (a) a glass syringe to deliver measured amount of solvent; (b) mini TLC tank; (c) mini silica plates; (d) micropipettes; (e) standard aflatoxin and (f) hand held battery operated UV torch.

Typically the toxin is extracted from 10 g sample of foodstuff or feed with acetone and water mixture and further with the chloroform. The extracted material is analysed by mini thin layer chromatography. It takes about 5 min. The aflatoxin spots are visualised by flashing battery operated UV lamp and estimation of toxin content done by a comparison with the standard.

Further information can be obtained from Director, CFTRI, Mysore- 570 013.

ICRISAT Develops Kit to Detect Aflatoxins

Scientists at the International Crops Research Institute for Semi-Arid Tropics (ICRISAT) have developed an inexpensive kit to detect aflatoxins, in partnership with the Government of Andhra Pradesh and a private poultry firm called Janaki Feeds. The United Kingdom's Department for International Development has committed funding for the project, according to Dr. D.V.R. Reddy, a senior virologist at ICRISAT.

Dr. Reddy says that aflatoxins pose a very serious problem for agricultural commodities such as maize, chillies, turmeric and groundnut. He said that in 1994, over two lakh chicken died in Andhra Pradesh after eating feeds containing aflatoxins. These are potent, carcinogenic and immune suppressive, when the *Aspergillus* fungus invades agricultural commodities. However, most developing countries have no aflatoxin monitoring kits using immunochemical methods. Commercial kits are expensive, and it costs about \$ 12 to check one sample for aflatoxins.

In pilot studies, polyclinical antibodies have already been produced.

Plastic From Palm Oil Effluents

Malaysian scientists have developed a process to convert effluents churned out from the palm oil mills to bioplastics. The process developed by scientists at University Putra Malaysia, can also be used in food applications such as disposable cutleries and cups, as it can tolerate temperatures upto 14°C. Normally, palm oil effluents are bio-treated to convert them into organic acids, which then break down into gases.

The new process starts the same way, but the degradation is arrested before the acids decay into gases and the acid laden liquids are separated from the solids. Bacteria, of an undisclosed strain are then mixed into and fed on the acids accumulating up to 70 per cent by weight of polyhydroxy alkanoates (bioplastics) in their cells.

After a week, the bacteria are killed by a solvent like chloroform, and the cell walls are physically broken down and filtered out. Finally, the solvent is evaporated, leaving the plastic behind. The plastic could be produced at a rate of 1.5 US dollar per kilogram, about twice the cost of commodity plastics.

New Grain Storage Facility For Humid Region Crops

A low cost rural storage technology has been developed by scientists at the Indian Agriculture Research Institute (IARI) for food grains, drastically affected by hu-

midity and high temperature in the coastal districts of Orissa. The simple storage facility called "Pusa Kothar" consists of air tight mud brick compartments, which retain low oxygen levels because of the 100 gauze thick plastic sheets embedded in between two mud walls. The grain filling inlet and empty outlet are made reasonably airtight to restrict loss of germination due to humid and high thermal environment at all stages of crop production and post-harvest.

The process is most effective in dry grain specially below 10 per cent level of moisture content. Based on meteorological data, IARI scientists had demarcated eight agro-climatic zones in the country with diversified agro-conditions and crops of varying temperature, humidity and rainfall. This is currently being utilised to enhance the efficiency of the godowns by identifying better criteria of safe storage.

During a nation-wide study, farmers identified drying devices as most vital to enhance the life of harvested grain specially kharif crops in humid regions. Practices so far in use had been largely infecting the stored grains and farmers had to incur losses.

Traditional rural storage practice like "thekka" (mudbins), "khattis" (room storage), "bhunsa" (paddy straw) and "pura" (wooden baskets) have been taken over by the use of chemicals like malathion and celphos tablets for fumigation in wheat belts. This leads to large scale pesticide poisoning. Legumes being highly marketable do not need much storage intervention except for chickpea, which has a single crop season. Similar is the situation with hillside groundnut crops where the nuts are retained for a very short time at oil mills.

Oil cakes, both of oil crops

and rice mills, are prone to insect attacks also. Among species, turmeric, coriander, chilli and cumin are bulky and thus prone to insect damage. Potato and garlic bulbs are very problematic crops with the potato moth and *Cadra cautella walker* largely infesting them in storage facilities. IARI entomologists' team is working to develop climate-specific storage facilities for various crops in other parts of the country.

Tapioca-Based Polymer Developed in India to Revolutionise Plastic Packaging

The Indian Tuber Crop Research Institute at Koyimkulam, Tamil Nadu, has extracted an eco-friendly biodegradable polymer from tapioca. This break through, according to Mr. Ashok Parthasarathi (Secretary, Ministry of Food Processing Industry) will revolutionise plastic packaging. The polymer is being patented worldwide, and when commercialised with bulk production will reduce the cost of disposable plastic bags considerably. Parthasarathy recently reported at the Confederation of Indian Industry - organized Food Pro 97 that this tapioca-based polymer can replace about 40% of the conventional petrochemical-based polymers used in plastic packaging. Trial runs have shown that the tapioca-based polymer can even be used for food grade packaging. Pilot plant trials are under progress and commercial production of the polymer is scheduled for late 1998.

Fungus To Fight Tomato Pest

Scientists have found a fungus that can serve as an effective weapon to ward off a nematode worm that commonly attacks tomato plants. Scientists at the Indian Agriculture Research Institute (IARI) in New Delhi say the fungus *paecilomyces lilacinus* can parasitise eggs of the root knot nematode (*meloidogyne incognita*) which infects tomato plants. A team from IARI's Nematology Department found that of the six isolates of *p. Lilacinus* collected from various parts of India and studied by them, one proved to be extremely promising. The isolate inhibited hatching of the nematode eggs by 75% in the laboratory and 66% in soil. The fungal isolate retained its virulence even after being cultured 20 times and grew well on neem (*Azadirachta indica*) cake, a report prepared by Mr. M. R. Khan says. Mr. Khan's paper was presented during the 36th convocation week of IARI in February. Studies by the IARI team showed that optimum dose of inoculation was eight grams of fungus infested rice per kg soil. The fungus provided carry-over protection of tomato crop in the second season. An additional fresh inoculation in the second season suppressed the nematode upto almost 70%, the report said.

Women, Seniors, Vegetarians Eat Healthier Diets

Women generally eat healthier diets than men and senior citizens and vegetarians generally eat the healthiest diets of all, according to US Agriculture Department said in new report. One key reason was that individuals in those groups tend to be better informed about nutrition and the link between poor diet and certain diseases, the department said.

"The report demonstrates a strong case that information and knowledge are the keys to open the door to better diets and in turn to better health, longer lives and children with improved cognitive and learning abilities," said Miley Gonzalez, Agriculture under secretary for research, education and economics. The "Healthy eating Index" (HEI) developed by the department's Centre for Nutrition Policy and Promotion (CNPP) measured how closely an individual's diet conforms with the dietary guidelines published every five years by the Federal Government and department's Food Pyramid, which recommends daily food serving levels.

For an healthy diet, the government recommended individuals restrict daily fat calorie intake to

less than 30 per cent of total calories and for saturated fat, less than 10 per cent of total calories. High levels of cholesterol and sodium should also be avoided.

The Food Pyramid suggests a daily diet based on six to 11 servings of vegetables, two to four servings of fruits, two to three servings of milk and two to three servings of meat, with some variation in those categories for age.

The new report not only found a correlation between nutrition knowledge and the healthiness of an individual's diet but also between age, race, income, sex and education levels. With 100 being a perfect score, people below age 30 had an average HEI score of 59.28, compared to 67.17 for folks in their 50s and 60s. People or 70 older had a score of 69.33, the highest of any group.

Rice-Bran Oil - A New Antioxidant For Edible Oils

The use of rice bran oil (US Pat 5552167) is an antioxidant in high linolenic edible oils (e.g. soy and rapeseed oils). Such stabilised oils may be useful as spray oils for crackers, nuts, chips and other snack foods. The oils are stabilised by the addition of 2 to 5% (w/w) rice bran oil that is processed to retain unsaponifiable matter. Physically refined rice bran oil may also be used.

ADVERTISERS' INDEX

Ganesh Anhydride

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GITCO Limited

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DATA BANK

Qty in Tonnes & Value in Rs. Lakhs

ITEM WISE EXPORT OF SPICES FROM INDIA

Item	1993-94		1994-95		1995-96		1996-97		1997-98 (E)	
	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value
PEPPER	48,743	18909.67	37,264	23664.19	26,244	19629.84	47,893	41231.84	34,250	47956.75
CARDAMOM (S)	387	1454.83	257	762.61	527	1296.97	226	869.67	260	892.30
CARDAMOM (I)	1,797	1256.96	1,293	812.74	1,677	1224.06	1,628	1209.53	1,450	1035.90
CHILLI	30,776	7213.56	20,096	5711.63	56,165	19546.17	50,051	20145.15	43,450	14013.25
GINGER	18,442	2478.12	12,022	1673.03	18,483	3892.13	29,737	5924.41	28,550	6781.25
TURMERIC	25,436	5256.00	28,286	4517.96	27,050	4620.33	23,091	5844.61	24,900	7510.00
CORIANDER	13,552	2103.51	10,702	1793.84	11,541	2243.34	12,574	3136.58	20,100	5441.25
CUMIN	3,225	1630.36	5,618	2449.65	3,871	1739.32	6,375	3437.80	12,150	6089.50
CELERY	4,130	662.62	2,601	777.28	2,678	625.12	3,780	801.76	3,000	690.00
FENNEL	2,637	642.18	2,029	581.56	2,594	751.73	4,850	1788.60	11,100	3206.10
FENUGREEK	4,934	721.41	7,956	1224.97	15,138	1867.20	8,891	1204.57	5,000	795.00
OTHER SEEDS (1)	1,938	402.85	2,338	486.86	2,493	518.52	3,059	842.60	4,170	855.75
GARLIC	2,845	354.89	633	122.87	3,935	491.26	4,889	797.74	4,000	760.20
OTHER SEEDS (2)	17,318	2648.42	16,523	2954.61	23,492	3989.63	18,955	4429.68	16,450	5526.45
CURRY POWDER	3,411	1231.92	4,135	1443.27	4,246	1755.50	4,639	2056.52	5,125	2225.55
MINT OIL	1,410	3015.72	1,583	4356.78	1,352	4750.12	2,371	13449.50	2,525	8788.00
SPICE OILS AND OLEORESINS	1,355	7160.99	1,672	8676.68	1,912	11501.77	2,358	15901.21	2,270	22648.00
TOTAL	182,336	57144.01	155,008	62010.53	203,398	80443.01	225,295	123071.77	218,750	135215.25
VALUE IN MILLIONS US \$		182.57		197.86		241.43		346.97		336.62

(E) ESTIMATE

(1) INCLUDE BISHOPS WEED (AJWANSEED), DILL SEED, POPPY SEED, ANISEED, MUSTARD ETC.

(2) INCLUDE TAMARIND, ASAFOETIDA, CINNAMON, CASSIA, TEJPAT, KOKAM, SAFFRON ETC.

SOURCE: DGCI & S., CALCUTTA/SHIPPING BILLS/EXPORTERS' RETURNS.

DATA BANK

NUMBER OF RICE MILLS IN INDIA AS ON 1.1.1998

S.No.	Name of State	Hullers	Shellers	Huller cum Shellers	Modern/ Modernised Rice Mills	Total
1.	Andhra Pradesh	4609	1776	2364	12995	21744
2.	Assam	431	14	2133	242	2820
3.	Bihar	4749	63	9	51	4872
4.	Gujarat	1890	159	67	1045	3161
5.	Haryana	807	-	--	990	1797
6.	Himachal Pradesh	890	1	3	222	1116
7.	Jammu & Kashmir	--	--	--	--	--
8.	Karnataka	9131	462	1103	3674	14370
9.	Kerala	13664	--	13	2533	16210
10.	Madhya Pradesh	3918	201	262	1661	6042
11.	Maharashtra	8199	273	541	1759	10772
12.	Manipur	838	--	--	560	1398
13.	Meghalaya	252	--	8	--	260
14.	Nagaland	--	--	--	--	--
15.	Orissa	6398	125	289	552	7364
16.	Punjab	4416	442	--	1965	6823
17.	Rajasthan	152	2	6	193	353
18.	Sikkim	17	--	--	--	17
19.	Tamil Nadu	13684	448	1324	3922	19378
20.	Tripura	1030	6	8	1	1045
21.	Uttar Pradesh	5707	562	150	1215	7634
22.	West Bengal	9554	3	72	1	10555
23.	Andaman & Nicobar	116	--	--	926	116
24.	Arunachal Pradesh	1	--	--	--	1
25.	Chandigarh	16	--	--	--	27
26.	Dadar & Nagar Haveli	8	1	--	11	9
27.	Delhi	2	--	--	27	29
28.	Goa	670	--	25	56	751
29.	Mizoram	--	--	--	--	--
30.	Pondicherry	138	--	8	88	234
31.	Lakshadweep	---	--	--	--	--
Total		91267	4538	8385	34688	138898

TRADE FAIRS & GET-TOGETHERS

Third National Conference on Trends in Drugs and Pharmaceutical Research : Global Scenario (October 4 - 5, 1998)

The Indian Society of Chemists & Biologists, Lucknow Chapter is organising the 3rd National Conference on the theme " Trends in Drugs and Pharmaceutical Research : Global Scenario" at the College of Pharmaceutical Sciences, Manipal, Karnataka State during October 4-5, 1998.

The aims of the conference are:

1. To promote and advance the cause of multidisciplinary research by providing a common platform for better cooperation and coordination.
2. To develop national consensus among younger generation to strive for interdisciplinary cooperation.
3. To make aware of the recent developments of science in frontal areas.

For more information, please contact:

Dr. N. Udupa
Organising Secretary,
College of
Pharmaceutical Sciences,
Manipal 576 119,
Karnataka State.
India.

World Renewable Energy Congress (10-13, February 1999)

Australian CRC for Renewable Energy and Institute for Environmental Science are jointly organising an International Conference on Renewable Energy Technologies and Policies for Sustainable Developments during 10-13, February 1999. The venue of the Conference is Murdoch University which is situated about 15 km south of the city of Perth and 8 km east of the port city of Fremantle in Western Australia. The conference will bring together scientists, engineers, policy makers, end users, manufacturers and international development agencies to discuss issues in renewable energy and sustainable development.

For further information, please contact :

Dr. Kuruvilla Mathew,
Environmental Science,
Murdoch University,
Murdoch WA 6150
Australia
Phone : + 61 893602896
Fax : + 61 893104997
Email : Mathew@essunl.murdoch.edu.au. or visit Website
<http://wwwphys.murdoch.edu.au/acre/>

Workshop on High Pressure Stainless Steels in Sanitary Service

(18-19, October 1998)

International Association of Food Industry Suppliers and Nickel Development Institute (NIDI) are jointly organising a workshop on Selection and Fabrication of Stainless Steels for Sanitary Service at Hotel Sofitel, Rosemont, Illinois, U.S.A., during October 18-19, 1998.

Workshop sessions will deliver the latest knowledge and developments in such areas as (i) Types and properties of stainless steel and other nickel alloys (ii) Welding processes for stainless steel in sanitary service (iii) Special welding techniques (iv) Cleaning sanitizing (v) Fabrication requirements for stainless steel used in food and beverage processing (vi) FDS requirements and beverage processing and (vii) Contamination - how to detect, avoid and prevent it.

For further details, contact:

Dorothy Brady,
IAFIS,
1451, Dolley Madison Boulevard,
Mc Lean, VA 22101 - 3850
U.S.A.,
or
Tom Gilmore
at IAFIS,
Phone : 703 - 761 - 2600
Fax : 703 - 761 - 4334
E-mail : info @ iafis. org.

TRADE FAIRS & GET-TOGETHERS

Central Food Technological Research Institute, Mysore- 570 013 Tentative List of Short Term Courses for the Years 1998-99

(Subject to confirmation)

05-10-98 to 09-10-98	Processing of Cereals and Pulses
05-10-98 to 09-10-98	Evaluation and Identification of Plastics for their Safe Use in Food Contact Applications.
19-10-96 to 23-10-98	Practical Approaches to the Analysis of Carbohydrates.
26-10-98 to 30-10-98	Bakery Science and Technology.
02-11-98 to 13-11-98	Quality Control Management in Meat Processing.
16-11-98 to 20-11-98	Micro Propagation Economically Important Plants.
16-11-98 to 20-11-98	Packaging of Fresh Processed Foods.
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Minimum qualification for participation is a degree in Science. Experience in the respective area is desirable.

For details please contact

Head, Human Resource Development Department, CFTRI, Mysore - 570 013.

Ph : 514310/514760; Fax : 0821-516308/517233.

JFST

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The AFST (I) Education and Publication Trust invites applications for grant of scholarships to students who are undergoing Post-graduate studies in Food Science and Technology both first and second years (1989-99 and 1999-2000). The main criterion for the grant of scholarship is merit as well as economical condition of the student. Students, who satisfy these conditions may kindly send applications through their respective Heads of Institutions/ Colleges with a certificate from the revenue department (not below the rank of Tashildar) indicating the income of the parent/guardian so as to enable the trustees to consider their applications for grant of scholarship. The scholarship amount is Rs. 500/- per month and this is applicable from the academic year. The applications may kindly be sent to the Secretary, AFST (1), CFTRI Campus, Mysore - 570 013 on or before 15th October 1998.

IFCON '98 AND FOOD EXPO '98

November, 24-27, 1998 at Mysore

The second circular giving the full operational details of IFCON '98 and FOOD EXPO '98 has already been sent out to all the members of the Association. It is heartening to note that there has been an overwhelming response from Scientists through abstracts of their research papers for posters presentation and technical sessions. The response to participate in technology show cause of value-added foods (EXPO'98) is equally encouraging. The stalls earmarked for the show are fast filling up with entrepreneurs responding in a big way. The organisers of this mega event are looking forward to meet all the participants, both Indian and overseas and get the benefit of interacting with them.

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